FACTORS AFFECTING THE SUCCESSFUL IMPLEMENTATION OF RURAL ELECTRIFICATION PROJECTS IN ETHIOPIA

By

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DECLARATION

I hereby declare that this thesis entitled "**Factors Affecting the Successful Implementation of Rural Electrification Projects in Ethiopia"** is my original work under the guidance and supervision of Dr, Kassahun Yimer. I also declare that this thesis has not been previously or concurrently submitted, either in whole or in part except where due acknowledgment has been made for all reference materials used in this thesis.

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GRADUATE PROGRAM

CERTIFICATE

This is to certify that the thesis prepared by Mr. **Behailu Ayele Woldesemaite** entitled **"Factors Affecting the Successful Implementation of Rural Electrification Projects in Ethiopia"** and submitted in fulfillment of the requirements for the degree of Master of Business Administration in Construction Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

This study identifies and evaluates the most influential factors affecting the success of rural electrification projects implemented by Universal Electric Access Program of Ethiopian Electric Utility. The study is motivated by the poor performance of project implementation witnessed in the past years which has resulted in failure to meet project objectives and ultimately decreased end user satisfaction. Several literatures have been reviewed and lists of variables have been identified to develop conceptual framework of the study. Accordingly, this study has chosen thirty seven (37) factors categorized in six (6) groups, namely project management factors, organization related factors, procurement and contract related factors, project manager and team related factors, contractor/ supplier related factors and external and work environment factors. The questionnaire survey was conducted among the target population of the study consisting of project managers, project engineers, supervisors, technical staffs, consultants, contractors and suppliers who are involved in rural electrification projects. The respondents were asked to rank the factors in a range of one to five likert scale. The collected data were presented in descriptive statistics computed using statistical package for the social science (SPSS) software and further analyzed using relative importance index method. Factor Analysis was also conducted in order to study the factors correlation. The factors were ranked on the basis of relative importance index result. The top ten (10) most affecting factors identified, in descending order of importance, were aligned supply chain of goods/ materials and services, site related factors, risk identification and allocation, troubleshooting/ problem solving, adequate project feasibility study, adequate project control and change management, realistic project cost and time estimates (scheduling), organizational/ corporate culture, physical environmental factors and adequate project funding/ budget to completion. The exploratory factor analysis also demonstrated a highly correlated specific set

of eleven (11) success factors. The identified influential factors were associated with constraints and stakeholder issues. Therefore, the recommendation is to apply the concept of theory of constraints and stakeholder theory as instruments in the project management to create an efficient and effective work flow for achieving a higher level of performance.

Key Words: *Rural Electrification, Project success factors, Relative importance index, Theory of constraints*

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LIST OF ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
BADEA	Arab Bank for Economic Development in Africa
CSF	Critical Success Factors
EEPCO	Ethiopian Electric Power Corporation
EEP	Ethiopian Electric Power
EEU	Ethiopian Electric Utility
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
IEA	International Energy Agency
KMO	Kaiser-Meyer Olkin
KPI	Key Performance Indicator
OFID	OPEC Fund for International Development
OPEC	Organization of Petroleum Exporting Countries
PMBoK	Project Management Body of Knowledge
SNN	South Nations, Nationalities and Peoples
TOC	Theory of Constraints
UEAP	Universal Electric Access Program

1. INTRODUCTION

1.1 Background of the Study

Despite widely recognized importance, electricity is not available everywhere with many people still depending on alternative sources of energy such as wood, charcoal and kerosene (Pelegrini and Tasciotti 2012). According to IEA (2016) report, nearly 1.2 billion people have no access to electricity globally in 2014; almost all of them live in developing countries. The region most affected by the lack of electrification is Africa, specifically Sub-Saharan Africa having access rate not higher than 35%. These figures are even more alarming when we consider the electrification rates in rural areas, while rural electrification rates of developed countries reached to 100 % in 2014.

Ethiopia is an agricultural economy country in east Africa with a population of 100 million. Nearly 85% of the population lives in rural areas and most of the households in rural towns and villages have no access to electricity. Like most other sub-Saharan countries, Ethiopia's electricity access has been quite low. According to EEPCO Newsletter (2008) and World Bank, (2015a) report, the country's electricity coverage was 17% in 2006, However by the continued effort of the Government of Ethiopia has resulted a steady expansion of rural electricity access over the past years, the electric access coverage now reached to 57.17% (UEAP's 2009 E.C monthly performance report summary is attached under Appendix 1).

Electricity alone may not be able to create all the conditions for economic growth, but it is obviously essential for basic human needs and economic activity (IEA, 2016). In theory, access to electricity can improve socio-economic conditions in developing countries

through its influence on key components of poverty, namely health, education, production and environment (Kanagawa and Nakata, 2008). Concerning rural areas, Khandker *et al* (2009) claim that lack of access to energy and more precisely to electricity is one of the major impediments to economic development. Chaurey *et al* (2004) argue that a strong correlation exists between rural poverty and access to electricity because electricity is a pre-requisite for better living standards and also indispensable input for productive and economic activities.

This research focuses particularly on rural electrification projects in Ethiopia undertaken by Universal Electricity Access Program (UEAP) which is a separate office under the control of Ethiopian Electric Utility (EEU) and primarily engaged in the rural electrification to increase the electricity access to rural towns and villages. EEU is one of the companies formed in 2014, when the former Ethiopian Electric Power Corporation (EEPCO) was restructured into two separate companies namely: The Ethiopian Electric Utility and the Ethiopian Electric Power (EEP). The restructuring was undertaken to create companies that are capable of providing efficient and reliable service to cope up with the fast growing economic development of the country. EEU is mandated with distributing and selling of electric power to customers while EEP is responsible for generating and transmitting electric power. The business relationship between the two companies is that EEP wholesales the generated and transmitted bulk electric power to EEU whereas EEU in turn distributes the electric power and retails to customers.

UEAP was established in 2005 with the objective of increasing the electricity access of the nation that was initially 15% by constructing electric power transmission, substation and distribution infrastructures. The Program Office comprises of different project units that

are being financed by the Government of Ethiopia and by developmental partners namely World Bank (WB), African Development Bank (AfDB), Arab Bank for Economic Development in Africa (BADEA), Saudi Fund, OPEC Fund for International Development (OFID), and the Kuwait Fund. The Program Office is organized in a decentralized structure in which a head office bases in Addis Ababa and eight regional offices at Addis Ababa and a separate and independent offices for Oromia, Mekele, Bahirdar, Awassa, Assosa, Gambella, Jijiga and Semera. (Please refer to the organizational structure under Appendix 3.) Currently UEAP is implementing a large number of projects for the realization of strategic goals of GTP II to increase electric coverage to 90% and to help in transforming Ethiopia to a middle-income country by 2025 (World bank, 2015b) and achieving millennium goals.

1.2 Statement of the Problem

Under the GTP II of Ethiopia UEAP was tasked to increase access of electricity in the rural towns and villages of all regions from 54 percent in the beginning 2009 E.C to 90 percent coverage access to electricity by electrifying 10,205 towns. Evidently in the year 2008 Ethiopian fiscal year alone, it was planned to electrify 2042 rural towns and villages (Strategic plan of EEU/UEAP and GTP II plan) but only 398 towns were completed which was 19.4% of the strategic plan. Likewise last fiscal year 2009 E.C, the plan was to electrify 1227 towns but until the end of fourth quarter 709 towns were completed with a performance of 57.78%. (UEAP's 2009 E.C monthly performance summary table is shown in Appendix 2)

It is witnessed that the rural electrification projects implemented in Ethiopia are facing challenges of poor performance against the plan, most commonly late completion in a significant extension of time and concurrent cost overrun. Kefyalew (2015) concluded that there is a project failure in UEAP due to quality of deployed manpower, project payment category and project size. The poor project implementation has negatively impacted both the social and economic benefits that would have been gained if the projects were completed on time and on budget. The GoE allocates and spends a substantial amount of budget for rural electrification with an aim to promote social and economic development in rural areas and attaining more equitable distribution of developmental benefits, but the projects performance is much less than what was planned and expected.

Despite the serious efforts that have been made in the past three years by the GoE in addressing the issues to improve the performance of rural electrification program, the projects continued to heavily suffer from poor implementation performance. This subsequently slows down socio-economic development and hinders poverty reduction endeavors for improving living conditions of rural communities. In fact, the strategic plan set by the Government to electrify rural towns and villages seems to be very ambitious with respect to existing capacity of implementing program office and local contractors but the electrification projects which are realistically within the capacity of implementation showed poor performance in the past years. It is therefore important that a study be conducted to identify the critical factors which need to be addressed and attention be given to improve the likelihood of successful implementation of electrification projects. On the other hand not taking these success factors seriously might lead to the failure of the projects.

1.3 Research Questions

1. What are the significant factors that are affecting the successful implementation of rural electrification projects in Ethiopia?
2. What are the extents and relative rankings of these factors affecting the successful implementation of rural electrification projects in Ethiopia?
3. What is the inter-relationship between these factors affecting successful implementation of rural electrification projects in Ethiopia?
4. What are the potential solutions for achieving successful implementation of rural electrification projects in Ethiopia?

1.4 Objectives of the Study

a. **General Objective:** The general objective of this study is to determine the factors affecting successful implementation of rural electrification projects in Ethiopia.

b. Specific Objective: The specific objectives of this study are:

i. To identify the significant factors affecting the successful implementation of rural electrification projects in Ethiopia.

ii. To determine the extent of influence and rank them in the order of their importance of factors affecting the successful implementation of rural electrification projects in Ethiopia.

iii. To explore the inter-relationships between factors affecting the successful implementation of rural electrification projects in Ethiopia.

iv. To recommend potential solutions for achieving successful implementation of rural electrification projects in Ethiopia.

1.5 Significance of the Study

Critically thinking of rural electrification projects for ensuring growth and development of a given nation and looking at the resource constraints, ranging from human resource to financial constraints, poor capacity of contractors, week implementation capacity of the implementer and others; it necessary to investigate factors that are important for a rural electrification project success and identify the most influential ones that are determining the effective implementation.

Therefore, the significance of this study is to highlight the key success factors that the project team must pay closer attention to in order that the projects can be completed within budget and schedule, to acceptable level of quality, and to the satisfaction of end users. Secondly the findings and recommendations from this study will serve as reliable information to Government and project stakeholders in the formulation and implementation policies to improve the performance in order to ensure successful completion of electrification projects. Thirdly the study will have significance in addressing crucial problem to the stakeholder as it has not been studied by others before. Lastly the study will also provide some relevant information for further studies on this particular or related topic.

1.6 Delimitation of the Study

The study setting was limited to UEAP's head office in Addis Ababa and typically selected Oromia regional office. The target populations were the management and project staffs, consultants, contractors and suppliers as key respondents. However, the local communities or beneficiaries did not participate in this research. However maximum effort has been put in place to diversify key stakeholders who were active participant on the projects. The

scope of the study covers only low voltage and medium voltage distribution network construction projects for both own force and contract projects. However transmission line and substation expansion projects undertaken under UEAP are not included in this study. The scope of the study was also limited to the construction process of electrical infrastructures within the project life cycle from feasibility study to handover of completed works but the challenges of electrification regarding to existing grid, adequacy of power, electric power connection to customers, operational issues were not been considered.

1.7 Limitation of the Study

The study encountered time constraint as the period allocated for the study was limited at the initial stage and, therefore, it was designed to collect questionnaire data in Addis Ababa as a representative of all the possible respondents. The study also experienced a problem that some of the respondents were unwilling to give genuine information or reserved from revealing the fact due to fear, but this were overcome by explaining the purpose for which the study was being undertaken purely for academic purpose.

2. LITERATURE REVIEW

2.1 Project Concepts

This section presents some ideas regarding what defines a project, how a construction project is defined, what project management is and what aspects of construction management are fundamental for successful implementation of projects.

2.1.1 Project

A project can be defined in many ways in various literatures and a variety of definitions give a more complete picture of what a project is.

- "A project can be considered to be any series of activities and tasks that have a specific objective to be completed within certain specifications, defined start and end dates, funding limits, consume human and nonhuman resources (i.e., money, people, and equipment) and is multifunctional (i.e., cut across several functional lines)" (Kerzner, 2013).
- "A project is a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2013).
- "A project is a sequence of unique complex, and connected activities that have one goal or purpose and that must be completed by a specific time, within budget, and according to specification" (Wysocki, 2014)
- "An endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives". (Turner and Müller, 2003).

2.1.2 Program

There are situations where a number of similar projects owned by the same organization, financed by the same financier and managed by the same project management team. Most of the project management literatures categorize this group of projects as a program. PMI (2013) for instance, defines program as a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. Turner and Müller (2003) share the same definition when they mention a program as a temporary organization in which a group of projects are managed together to deliver higher order strategic objectives not delivered by any of the projects on their own. The benefit of managing those projects together, rather than manage them individually, is to optimize the utilization of resources available.

2.1.3 Construction Project

Construction project refers to a high-value, time bound and special construction mission with predetermined performance objectives (Chitkara, 1998). He further explains that the project mission is accomplished within complex project environments, by putting together human and nonhuman resources into a temporary organization, headed by a project manager. The major construction projects can be grouped into building construction, infrastructure construction, industrial construction and special-purpose projects.

Construction projects, just like other projects, have a predetermined duration with a beginning and an end. The starting point of a project is the time when the project idea is conceived by the client. The end marks the time when the mission is accomplished. The time span between the start and completion of a project represents the project life cycle.

The life cycle of a typical construction project can be broadly divided into the following phases: formulation phase, mobilization phase and construction phase.

- The **formulation phase** includes the conception of the project idea, feasibility studies, investment appraisal and project definition.
- The **mobilization phase** covers the preparation of the project preliminary plan, designs and drawings, contracts, resources mobilization and earmarking funds.
- The **construction phase** includes planning and controlling execution, inducting resources, construction and commissioning, and finally, handing over to the client (Chitkara, 1998).

The five main agencies actively associated with the execution of major works with in design and construction projects are listed in below, based on Chitkara's description (Chitkara, 1998):

1. **Business promoter:** The business promoter, also called the client, is the potential owner of the construction project. He sponsors the construction works and ultimately utilizes them. A client can be a government body, a public or private enterprises, or some private individual. It is the client who sponsors the works, finances their construction, and utilizes the facility constructed.
2. **Construction contractors**: Construction contractors form the backbone of the construction business as they execute most of the construction works. In the competitive construction business, which requires special resources for different types of construction work, the contractors generally tend to specialize in a particular area of construction.

3. **Architect and engineering associates:** Architect and engineering associates are the firms employing the architects and engineers. An architect is an individual who designs the buildings, landscapes and other artistic features. The engineers associated with architects develop structural, electrical, mechanical and other specialist systems and designs.
4. **Construction management consultants:** The consultants are hired by the client for carrying out certain services on contract basis, often for the entire life of the project. The nature of tasks assigned to the consultants vary, but may include but are not limited to: feasibility and cost estimates, soil investigation, designs, tendering and awarding contracts to bidders, develop detailed construction plans and supervising works.
5. **Input suppliers:** Input suppliers within the construction industry exist in the form of men, materials, machinery and money. The workforce connected with construction includes architects, engineers, managers, technical and non-technical staff, highly skilled operators, and skilled and unskilled manpower.

2.1.4 Project Management

The Project Management Institute's a Guide to the Project Management Body of Knowledge describes project management as: "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (PMI, 2013). Wysocki describes project management as: "an organized common-sense approach that utilizes the appropriate client involvement in order to deliver client requirements that meet expected incremental business value" (Wysocki, 2014).

Kerzner (2013) states that project management is designed to manage or control resources on a given activity, within time, cost, and performance. He further explains that time, cost, and performance are the constraints on the project. If the project is to be accomplished for an outside customer, then the project has a fourth constraint: good customer relations. Project management is not a one-person operation; it requires a group of individuals dedicated to the achievement of a specific goal. Project management includes the project manager, an assistant project manager, a project team and a project (home) office (Kerzner, 2013).

Hendrickson and Au (2008) pointed out that the management of construction project requires knowledge of modern management as well as an understanding of the design and construction process. Specifically, project management in construction encompasses a set of objectives which may be accomplished by implementing a series of operations subject to resources constraints. Subsequently, the functions of project management for construction generally include the following:

- Specification of project objectives and plans including definition of scope, budgeting scheduling, setting performance requirements and selecting project participants.
- Maximization of efficient resource utilization through procurement of labour, materials and equipment according to the prescribed schedule and plan.
- Implementation of various operations through proper coordination and control of planning, design, estimating, contracting and construction in the entire process.
- Development of effective communications and mechanisms for resolving conflicts among the various participants.

2.2 Factors that Affect Successful Project Implementation

2.2.1 What is a Successful Project Implementation?

It is difficult to define words such as success, because it means different things to different people and is very context-dependent. The common definition by Oxford English Dictionary define success as "The accomplishment of an aim or purpose". Since project success might be perceived differently by stakeholders, there is a need for comprehensive criteria that reflect their interests and views. Thus, stakeholders' satisfaction is taken as a main success criteria, complementary to the golden triangle of time, budget and quality.

Definition of project success by various researchers:

1. Pinto and Slevin (1987), a project is generally considered to be successfully implemented if it is completed on-schedule (time criterion), on-budget (monetary criterion), achieves basically all the goals originally set for it (effectiveness criterion) and accepted and used by the clients for whom the project is intended (client satisfaction criterion)
2. Kerzner (2013), successful project management can then be defined as having achieved the project objectives within time, cost, at the desired performance/technology level, utilizing the assigned resources effectively and efficiently and accepted by the customer
3. De Wit (1988), a project is considered an overall success if it meets the technical performance specifications or mission to be performed, and results in high level of satisfaction concerning project outcome among: key people in parent organization, key people on project team and key users or clients of project effort.

2.2.2 Project Success Criteria

Criteria are the sets of principles or standards by which success can be judged. Project success criteria is defined by Muller and Turner (2007) as variables that measure project success. Success criteria describes the qualitative or quantitative measures by which the success of the project is measured. They mainly relate to the products or deliverables produced by a project. They may include measurements that relate to performance levels, physical size of a product, cost of production, target dates for delivery. The success criteria will be defined near the start of the project in the concept phase when defining what it is the project is to produce. All success criteria need to be discussed, agreed and prioritized between the relevant stakeholders as each will have their own perspective of what success looks

Despite the fact that success criteria and key performance indicator (KPI) are used intergengably but they have contextual diffrence in that success criteria is what defines the success of the project or quantitative measures against which to judge the success, whereas key performance indicator are measures of success criteria that can be used throughout the project to check the progress to ensure a successful conclusion.

According to Samset (1998) a project success can be viewed from three different perspectives:

1. **Operational perspective (project outputs):** It is measured according to whether the project was completed on time, within costs and to the expected quality. Samset states that these are the most commonly applied measures of success, as well as the most limited perspective which only gives an indication of the delivery of the project itself.

2. **Tactical perspective (project goal)**: It gives a broader interpretation of the concept and focus on the extent to which the project has achieved its formal goal. This concern whether the impact of the project is predominantly positive and whether the project is relevant in relation to people's (e.g. user) needs.
3. **Strategic perspective (project purpose)**: It is the broadest interpretation of project success. This perspective can for example be based on measures of whether the project contributes to economic growth or positive changes in society. It focuses on whether its positive effects are sustainable in the long term.

These five criteria cover all of Samset's success perspectives

Operational perspective:

Efficiency: The delivery of the project in regard to time, cost and quality.

Tactical perspective:

1. **Effectiveness**: The extent to which the project goal has been achieved.
2. **Impact:** The sum of positive and negative, planned and unforeseen changes and effects of the project in society.
3. **Relevance**: The degree to which the project responds to real needs and priorities in society.

Strategic perspective:

Sustainability: The extent to which the positive effects of the project will continue in the future.

2.2.3 Project Success Factors

Project success factors are influences, conditions, or variables that can have a significant impact on the success of the project when properly sustained, maintained, or managed

(Milosevic and Patanakul, 2005). Lim and Mohamed (1999) defined a factor as "any circumstance, fact, or influence which contribute to a result" and further describe factors for project success as "influential forces which either facilitate or impede project success". While success criteria is the set of conditions necessary to make a judgment of project success, success factors are something that contribute to the project success. Different studies have identified different success factors and a lack of consensus of opinion among researchers on the criteria for judging project success and the factors that influence that success (Fortune and White, 2006). In addition, several studies addressing success factors have observed the impact of context on which factors are considered most critical as well as whether certain success factors are indeed related to success. In the management of construction project can be a better understanding by exploring the success factors for improving the performance of their projects. The project success factors will be determined when conducting an analysis of the context of the project using tools such as SWOT or PESTLE.

Various authors have identified a number of factors, either from experience or research that are important to project success (De Wit, 1988). For example, Pinto identified a widely known ten critical success factors that determine the successful outcome of a project. Briefly, the ten critical success factors within the project life cycle are defined as follows (Pinto and Slevin, 1988):

1. **Project Mission**: Initial clearly defined goals and general directions. The preparation of a detailed project scope statement is critical to project success. (Including the general project philosophy or general mission of the project, as well as commitment to those goals on the part of the team members).

2. **Top Management Support**: Willingness of top management to provide the necessary resources and authority/ power for project success. The flexible and adequate access to organizational resources is considered as a core precondition for effectively executing the project activities. This can hardly be available without definite and timely reaction and support from the top management of the project-executing organization.
3. **Project Schedule/Plan**: A detailed specification of the individual action steps required for project implementation.
4. **Client Consultation:** Communication, consultation, and active listening to all impacted parties.
5. **Competence of Project Team Members**: Recruitment, selection and training of the necessary personnel for the project team. The knowledge, skills, personal aims, and personal traits should be considered not only as a vital component of the overall organizational culture but also as an essential factor of the integrity and multi-functionality of the project team.
6. **Technical Tasks**: Availability of the required technology and expertise to accomplish the specific technical action steps.
7. **Client Acceptance**: The act of "selling" the final project to its ultimate intended users.
8. **Monitoring and Feedback**: Timely provision of comprehensive control information at each stage in the implementation process.
9. **Communication**: The provision of an appropriate network and necessary data to all key actors in the project implementation.
10. **Troubleshooting**: Ability to handle unexpected crises and deviations from plan.

One concise literature study by (Jiang, et al, 1996) produced a list of 13 success factors of which ten factors are very similar to Pintos only the three exceptions are listed below.

11. **Competence of Project Manager**- The competence of project manager has been identified as the most important factor for the successful realization of their project. The technical and administrative skills of the project manager, as well as his/her commitment and competence, become the most critical component during the project life cycle.
12. **Sufficient Resource Allocation**. These are Resources in the form of money, personnel, logistics, etc.
13. **Competent Contractors**- In the contemporary world, it is rarely possible for one and the same organization to have capabilities and competencies in every aspect of the work required. Competence of project partnership is vital for success of project.

After careful study of previous literatures to identify a number of variables influencing the success of project implementation, (Muhammad, et al, 2008) suggests that success factors can be grouped under seven main categories. These include project management factors, procurement related factors, client related factors, design team related factors, contractor related factors, project manager related factors and business and work environment related factors

2.2.3.1 Success Factors Related to the Project Management

Project management action is a key for project success. Then, the variables in project management include adequate communication, control mechanisms, feedback capabilities, troubleshooting, coordination effectiveness, decision making effectiveness, monitoring,

project organization structure, plan and schedule followed, related previous management experience., and finally the overall managerial actions.

Table 1: List of identified management related factors

	Project management related success factors	Reference Literature
1	Clearly defined and realistic goals/ objective	Pinto and Slevin (1987), Belassi and Tukel (1996), Chan, et al. (2004), Fortune and White (2006), Hyvari (2006), Muhammad, et al. (2008), Els, et al. (2012), Ejaz, et al. (2013), Hwang (2013), BMG Research (2014), Osorio, et al. (2014), Gunduz M. (2015), Silva Susi et al.(2015) and Tsiga, et al. (2016)
2	Effective communication among all project participants	
3	Adequate project control and change management	
4	Project performance monitoring and feedback	
5	Detailed and up-to-date Project Planning	
6	Adequate project feasibility studies	
7	Realistic project cost and time estimates (scheduling)	
8	Adequate use of project management tools and methodology	
9	Effective quality assurance programme	
10	Adequacy of designs and specifications	
11	Decision making effectiveness	
12	Trouble shooting / problem solving	
13	Risk identification and allocation	
14	Involvement and commitment of stakeholders	

Based on these studies, the researchers identified fourteen (14) widely recognized management related factors from different literatures and are summarized on table1.

2.2.3.2 Success Factors Related to the Organization

Success Factors for any organization are directly related to what an organization is, and how it operates (Total Success Center n.d.)

Table 2: List of identified organization related factors

	Organization related success factors	Reference Literature
1	Top management support and commitment to the project	Pinto and Slevin (1987), Osorio, et al. (2014), Belassi and Tukel (1996), Muhammad, et al. (2008), Tsiga, et al. (2016), Chan, et al. (2004), Hwang (2013), Hyvari (2006), Fortune and White (2006), BMG Research (2014), Ejaz, et al. (2013), Gunduz M. (2015)
2	Adequate project funding/ budget to completion	
3	Appropriate organizational structure	
4	Organizational culture	

Based on these studies, the researcher identified four (4) organization related factors from different literatures and are summarized on table 2.

2.2.3.3 Success Factors Related to Procurement and Contract

A number of researchers identified the importance of procurement factors and three attributes are used to measure this factor; they are procurement method (selection of the organization for the design and construction of the project), tendering method (procedures adopted for the selection of the project team and in particular the main contractor).

Table 3: List of identified procurement and contract related factors

	Procurement and contract related success factors	Reference Literature
1	Effective procurement and tendering methods	Osorio, et al. (2014), Muhammad, et al. (2008), Els, et al. (2012), Tsiga, et al. (2016), Chan, et al. (2004), Hyvari (2006), BMG Research (2014), Ejaz, et al. (2013), Gunduz M. (2015) and Silva Susi et al.(2015
2	Effective contract formulation and contract administration	
3	Aligned supply chain of goods/materials and services	

Based on these studies, the researchers identified three (3) procurement and contract related factors from different literatures and are summarized on table 3.

2.2.3.4 Success Factors Related to the Project Manager and Team

The project manager is another key stakeholder in a construction project and his competence is a critical factor affecting project planning, scheduling, and communication (Belassi and Tukel 1996). Variables under this factor consist of the skills and characteristics of project managers, their commitment, competence, experience, and authority.

Table 4: List of identified project manager and team related factors

	Project manager and team related success factors		Reference Literature
1	Competence and experience of project manager	Project manager	Osorio, et al. (2014), Belassi and Tukel (1996), Muhammad, et al. (2008), Tsiga, et al. (2016), Chan, et al. (2004), Hwang (2013), Fortune and White (2006), Ejaz, et al. (2013) and Gunduz M. (2015)
2	Managerial and leadership skills of project manager		
3	Project Manager's authority to take decisions		
4	Experience and competence of design/ project team	Project team	
5	Team spirit and commitment of design/ project team		

Based on these studies, the researchers identified five (5) project manager and team related factors from different literatures and are summarized on table 4.

2.2.3.5 Success Factors Related to the Contractor/ Supplier

The main contractor and subcontractors start their main duties when the project reaches the construction stage. The variables include contractor experience, site management, supervision and involvement of subcontracting, contractor's cash flow, effectiveness of cost control system,

Table 5: List of identified contractor/ supplier related factors

	Contractor/ supplier related success factors	Reference Literature
1	Contractor's/ supplier's competence and commitment	Belassi and Tukel (1996), Hwang (2013), Ejaz, et al. (2013) and Gunduz M. (2015)
2	Contractor experience	
3	Contractor's effective site management, control and coordination	
4	Contractor's/ supplier's cash flow/ financial capabilities	

Based on these studies, the researcher identified four (4) contractor/ supplier related factors from different literatures and are summarized on table 5.

2.2.3.6 Success Factors Related to the External and Work Environment

Akinsola et al. (1997) described ''environment'' as all external influences on the construction process, including social, political, and technical systems. The attributes used to measure this factor are economic environment, social environment, political environment, physical environment, industrial relation environment, and level of technology advanced.

Table 6: List of identified external and work environment related factors

	External and work environment success factors		Reference Literature
1	Economic related factors (e.g. exchange rate, inflation, price escalation etc.).	External factors	Belassi and Tukel (1996), Muhammad, et al. (2008), Tsiga, et al. (2016), Chan, et al. (2004), Hyvari (2006), and Fortune and White (2006), Akanni et al. (2014)
2	Political related factors (e.g. political interference, political conflicts, vandalism etc.).		
3	Socio-cultural related factors (e.g. customs, norms, values, languages, educational level, attitude towards social responsibility etc.).		
4	Technical and technological environment		
5	Physical environmental factors		
6	Site related factors (access road, ground conditions)		
7	X-Factor (fraudulent practices, corruption, favoritism, lack of ethics, etc.)	Work environment	

Based on these studies, the researcher identified seven (7) external and work environment related factors from different literatures and are summarized on table 6.

2.3 Theoretical Framework

This study bases on the following theories:

2.3.1 Theory of Constraints

A basic principle of Theory of Constraints (TOC) is that the unpleasant problems or "undesirable effects" we experience in a field such as project management are usually the result of relatively few core problems. "Relatively few" means a manageable number. If we can identify these few core problems, and can address them, the majority of the undesirable effects will go away. TOC is a common-sense combination of techniques and philosophy that can enable dramatic, rapid, and ongoing improvements by helping identify these core problems and by providing tools that allow the development of workable solutions (Newbold,1998).

Sebastiano and Ragnhild (2014), revealed that what is considered as a constraint in project management can be categorized in to four; as political constraints (such as defined vision, mission, scope of projects), technical constraints (such as competencies, technologies, existing infrastructure and natural conditions like geology, landscape and climate), social constraints (such as codes of conduct, organizational hierarchies, personal relationships and accepted/expected behaviors) and administrative constraints (such as budgets, project schedules, scope, written contractual agreements among others).

2.3.2 Stakeholder Theory

Stakeholders are defined as any group or individual who can affect or is affected by the achievement of the organization objectives (Freeman, 1984). Project stakeholders are individuals and organizations that are actively involved in the project or whose interests may be affected as a result of project execution or project completion. Further (Ritson, 2011) broadly categorized Stakeholders into internal stakeholder (employee, management etc.), connected stakeholder: (customer, supplier, competitor etc.) and external stakeholder (government, pressure groups etc). On the other hand, (Freeman, 1984) categorizes stakeholders into primary stake holders (employee, management, customer, supplier, financers, communities etc.), secondary stakeholders (government, competitor, pressure groups, and special interest groups)

The basic idea of stakeholder theory is that organizations have relationships with many constituent groups and that it can engender and maintain the support of these groups by considering and balancing their relevant interests (Kirsi, 2010). Kirsi further noted four premises of the stakeholder theory that; corporations have relationships with many constituent groups (stakeholders) that affect or are affected by its decisions, the theory is also concerned with the nature of these relationships in terms of both processes and outcomes for the firm and its stakeholders, that the interests of all (legitimate) stakeholders have intrinsic value and not one set of interests is assumed to dominate others, and finally the theory focuses on managerial decision making.

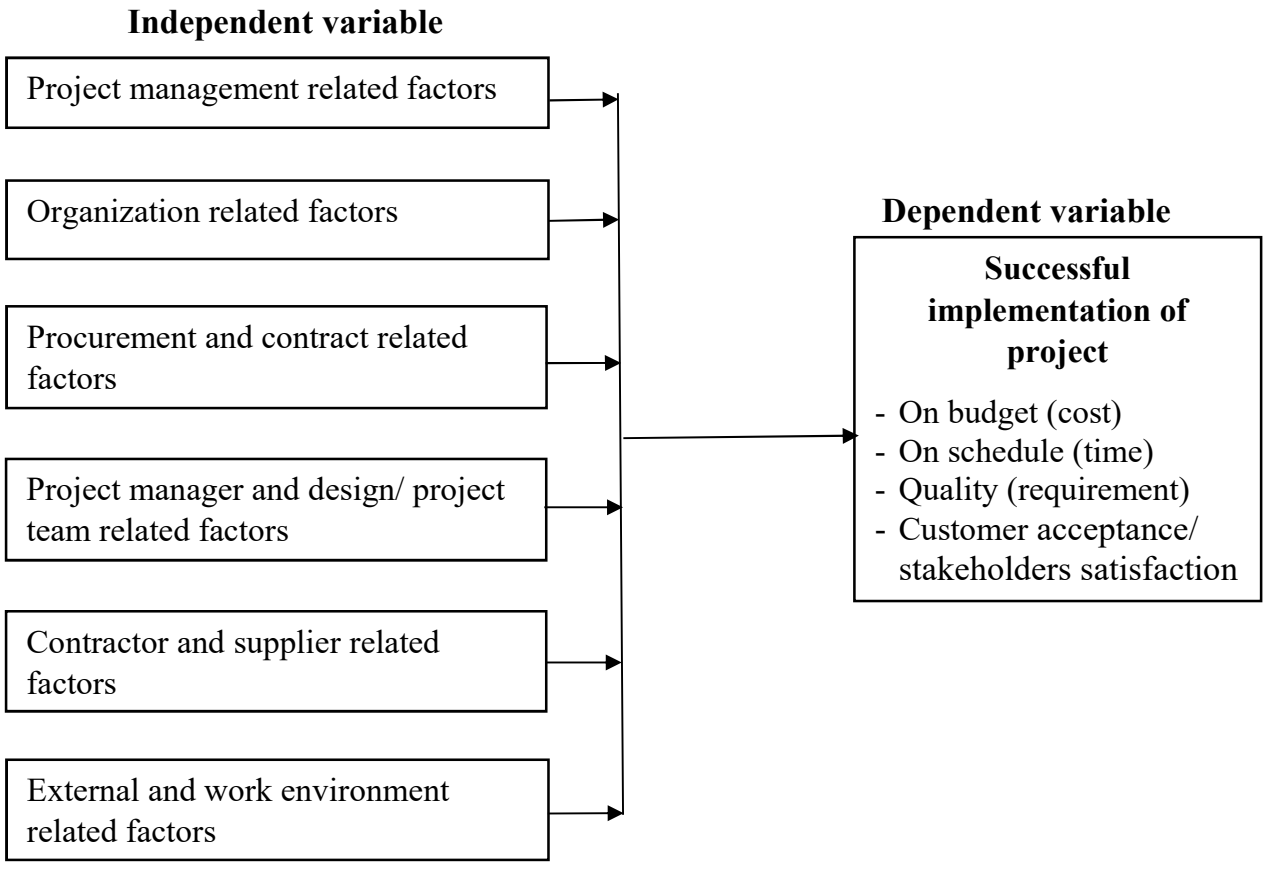
From the strategic management perspective, the primary question of stakeholder theory is which groups are stakeholders that require management attention, and which are not (Mitchell *et al* (1997). The management of project stakeholders is widely acknowledged

as an essential part of project management and as a factor contributing to project success (Bourne and Walker, 2004). In turn, various studies have postulated that the inability of project managers to take into accounts the claims and influences from project stakeholders is a reason for project failure.

2.3.3 Conceptual Framework

The conceptual framework helps to illustrate the fundamental relationships between the independent variable(s) and the dependent variable. The various variables affecting the successful completion of construction projects are identified from different literatures and the variables in each group are interrelated. The variable in one group can influence a variable in the other and the vice versa.

Figure 1: Conceptual framework



3. RESEARCH METHODOLOGY

3.1 General

This chapter contains the research setting, research design, target population, data collection method and data analysis method. Research design and methodology was essential in this study as it contains information on how the research process has been designed and conducted in a manner that was believed to integrate both basic concepts and actual facts in a clear and concrete manner. It was also believed to give an understanding to the variables and systematic approaches on the assessment and interpretations of data to come up with valid result.

3.2 Research Setting

This study has been undertaken at UEAP head office level and one typically selected UEAP regional office both of which bases in Addis Ababa. The research data was obtained from UEAP head office and UEAP Oromiya region office in Addis Ababa, where major decisions are taking place as well as potential target populations are available who have sufficient knowledge and particular experience on the subject of this study. Besides the researcher has got access easily to all key participants in the project offices

3.3 Research Design

This study has adopted a descriptive survey design. Descriptive survey is a method of collecting information by administering a questionnaire to a sample of individuals to answer the research questions (Orodho, 2003). The descriptive survey design is more preferable for the study that involves large population and conducts fast data collection. This study has also applied relative importance index analysis in order to determine

relative ranking of the independent variables and provide a better understanding of the factors affecting successful implementation of electrification projects.

3.4 Target Population

In order to evaluate, analyze and establish the factors affecting the successful implementation of rural electrification projects, a wide range of participants from stakeholders who are involved in electrification project were selected from UEAP head office and Oromiya regional office. The three categories of respondents were the main participants in the rural electrification projects and it was therefore necessary to engage and involve them in this study so as to obtain their varied and different perspectives and experiences. Participants were randomly selected and comprises of UEAP executive officer, project managers, head of regional UEAP office, engineers, supervisors, consultants and contractors.

3.5 Sample Size and Sampling Procedure

A systematic random sample was used to determine a statistically representative sample of the respondents from various groups namely owner /project office professionals/, consultant and contractor. According to Cochron, (1977) the formula which gives a procedure for the calculating statistically representative sample using the equation below was applied.

$$n = \frac{m}{1 + (\frac{m-1}{N})}$$

where n, m, and N represent the sample size of the limited, unlimited, and available population, respectively. On the other hand, m is estimated by the following equation:

$$m = \frac{Z^2 * P * (1 - P)}{e^2}$$

where Z is the statistical value for the confidence level used and corresponds to 1.96 for 95% confidence levels, P is the value of the population proportion which is being estimated and e is the sampling error or precision. The value of P is suggested a conservative value of 0.50 to be used,

$$m = \frac{1.96^2 * 0.5 * (1 - 0.5)}{0.1^2} = \mathbf{96.04}$$

Accordingly, the representative sample size of the population required is determined as shown below:

1. Owner:

$$n = \frac{96.04}{1 + (\frac{96.04 - 1}{140})} = \mathbf{58}$$

2. Consultant:

$$n = \frac{96.04}{1 + (\frac{96.04 - 1}{5})} = \mathbf{5}$$

3. Contractor:

$$n = \frac{96.04}{1 + (\frac{96.04 - 1}{60})} = \mathbf{38}$$

Table 7: Target population

Respondents category	Target population	Sample size	Percentage
Owner	140	58	41.43%
Consultant	5	5	100.00%
Contractors	60	38	63.33%
Total	**205**	**101**	**49.27%**

The total estimated population size of the study consisted of 205 individuals, which include project office professionals of different positions at head office and regional offices, contractors, suppliers, consultants. The overall sample size of this study was 101 out of which 58 respondents were owners, 5 consultants and 38 contractors as shown on table 7

3.6 Reliability Analysis:

Reliability test was conducted to check the stability and consistency of the questionnaires data by using Cronbach alpha method. When the value Cronbach alpha is more than 0.7, it is adequate for a survey instrument.

3.7 Method of Data Collection

This research utilized both primary and secondary data. Among the available methods in collecting data two methods were adopted in particular, these are structured questionnaires for primary data and literature review for secondary as shown on table 8.

Table 8: Data collection approach

Data sources	Data type	Data form
Primary data	Quantitative	Questionnaire
	Qualitative	
Secondary data	Quantitative	Various type of related documents
	Qualitative	

The questionnaires sought to obtain data on the assessment of the most influential factors affecting successful implementation of rural electrification projects in Ethiopia from project participants namely owner, consultants, and contractors who are actively associated with the projects activities and have sufficient experience in the field of electrification

projects. The questionnaires included both the closed and open ended questions. The participants were asked to indicate their response on identifying and assessing the extent of influence of factors for successful implementation of rural electrification projects.

The design philosophy of the questionnaire was based on the fact that they had to be simple, clear, and understandable for respondents. The questionnaire were carefully designed and its content reliability were also critically checked as to whether addresses the research questions. The questionnaire has been developed in a Likert scale to measure the identified variables. It is organized in the form of a scale rating (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree). The participants were required to rate the factors in the way they affect implementation of rural electrification projects using their own experiences. The numbers assigned to the agreement scale (1–5) do not indicate that the intervals between the scales are equal, nor do they indicate absolute quantities.

The questionnaire was divided into three major sections. The first section requires general information about the respondents' background such as (1) type of organization or company; (2) position in the organization or company; (3) years of experience in projects; and (4) educational qualification. The second section focuses on assessment of factors influencing successful implementation of rural electrification projects in Ethiopia. Literatures have been reviewed carefully to establish what others have documented on the subject matter. Based on various literature, thirty seven factors that are believed to have some influence on the project success were identified and taken as independent variables. These factors were grouped into six different categories, namely: project management related factors, organization related factors, procurement and contract related factors, project manager and design/ project team related factors, contractor related factors, and

external and work environment related factors. Respondents were given a chance to add other influential factors that were not mentioned on the questionnaires. The third section was a recommendation part on which respondents were asked to forward their possible solutions to ensure successful implementation of rural electrification projects in Ethiopia.

3.8 Method of Data Analysis

According to Orodho (2003), data analysis is the process of systematically searching and arranging filed notes, data and other materials obtained from the field survey with the aim of increasing one's own understanding and to enable one to present them to others. Initially all collected data were checked for logical consistency and completeness. The data collected were analyzed using both qualitative and quantitative methods of analysis. The quantitative data were analyzed using descriptive statistics where the responses from the questionnaires were counted, tabulated and analyzed using percentages, frequencies and weighted mean using Statistical Package for Social Sciences (SPSS). The study were also use relative important index analytical tools for collected data to establish the extent of influences and their relative importance ranking of independent variable.

3.8.1 Descriptive Analysis

The results of the questionnaires were analyzed using SPSS Version 24 (Statistical Package for the Social Sciences) software. SPSS provides a broad range of capabilities for the entire analytical process. All data and information from the questionnaires were coded and entered into SPSS program for statistical analysis in order to obtain frequency, percentage, mean and standard deviation of variables. Descriptive analysis was conducted to present the data for further analysis with relative importance analysis and statistical tests.

3.8.2 Relative Importance Index

In this study, relative importance index method (RII) was used to rank from perspective of owners, consultants and contractors, the factors on their degree of influence affecting successful implementation of rural electrification projects in Ethiopia. This method is vital in determining the ranking of different factors of different group of respondents. The ranking obtained from RII provides comparison study on the relative importance of the factors as perceived by the three groups of respondents namely owners, consultants and contractors.

Using the five-point Likert scale data, the relative importance index for each factor was calculated based on the following formula:

$$RII = \frac{\sum W}{A * N}$$

where: W - weight given to each factor by the respondents and ranges from 1 to 5; A - the highest weight (in this case is 5); N - total number of respondents. Then the factors were ranked based on the values of the RII. The value of the RII will vary from 0 to 1, the greater the value the higher the importance of each factor will be. After checking the results using Spearman rank correlation factor and T- test, the ranking of factors affecting success of electrification projects led to the conclusion of the study.

3.8.3 Factor Analysis

Factor analysis was performed on the survey data to determine for group among the inter-correlations of a set of variables in which the data may reduce or summarized using smaller set of factor or components (Pallant, 2007). In other words Timothy (2011) explains exploratory factor analysis looks for items that are most strongly correlated with

each other, then it groups them together into a factor and then looks for the next strongest batch of correlated items and puts those together into another factor. By looking at these items, collective name will be able to give to represent these items or factor. Statistical Package for Social Science (SPSS) software will be able to tell how many factors there are and how many items fall in the component/group (Pallant 2007). The Eigenvalue in scree plot determines the principal components, which are rotated orthogonally varimax, to obtain more evenly distributed factor loadings within the components.

According to Pallant (2007) three steps were adopted in conducting the factor analysis:

Step 1 Assesment of suitability of the data for factor analysis: Two main isues are considered in determining whether the data set is suitable for factor analysis. The Bartlett's Test of Sphericity should be statistically significant at $p < 0.05$ and the value Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO index) ranges from 0 to 1, with more than 0.6 suggested for a good factor analysis

Step 2: Factor extraction: It involves determining the smallest number if factors that cab be used to best represent the interrelation among the set of variables. Princpal component analysis approach was demostrated in this research. Scree test tecnique was also used which involves plotting the eigenvalues of each factors and inspecting the plots to find a point at which the shape of the curve changes direction and becomes horizontal.

Step 3: Factor rotation and interpretation: The rotated factor matrix shows how the factors are related to each factor (Timothy, 2011). The extracted factors was then rotated based on their factor loadings in a manner that is easier to interpret and to report. The most common orthogonal rotational approach particularly Varimax method was used in this research.

3.8.4 Spearman Rank Correlation Factor

Spearman's rank correlation factor is usually used to check the accurateness and precision of a data. The Spearman's correlation measure the strength of the relationship between different parties regarding different attributes (in this research the influential factors are the attributes). It can be calculated by applying the following formula.

$$r = 1 - \left[\left(6 - \sum d^2\right)/(n^3 - n)\right]$$

where r is the Spearman rank correlation coefficient between two parties, d is the difference between ranks assigned to variables for each factor, and n is the number of pairs of rank (in this paper it equals to the number of factors which is 37).

Spearman's rank correlation factor it is used to show the degree of agreement between the different parties. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). It might be said then that sample estimates of correlation close to unity in magnitude imply strong correlation, while values near zero indicate weak or no correlation.

3.8.5 T–Test

The T-Test is used to evaluate how close or related two different groups are. It determines whether there is a significant difference between the means of two unrelated groups. The formula is as follows:

$$\boldsymbol{t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{{S_1}^2}{n_1} + \frac{{S_2}^2}{n_2}}}}$$

where:x_1 - mean of first set of values; x_2 - mean of second set of values; S_1 - standard deviation of first set of values; S_2 - standard deviation of second set of values; n_1 - Total number of values in first set; n_2 - total number of values in second set. The significant level (alpha value) is set to be 0.05. The main value that is used to evaluate the groups is the significance value (p-value). If the value is greater than 0.05, the group variance can be treated as the same and no significant difference exists. However, if the value is less than 0.05 then a significant difference exists and different group variances.

4. RESULTS AND DISCUSSION

4.1 General

In this chapter the data collected was organized into a systematic format and presents analysis of the data on the factors influencing successful implementation of rural electrification projects in Ethiopia. The chapter also provides the major findings and results of the study. Based on the relative importance indices, rank within the corresponding groups and overall ranks of the factors investigated are presented and discussed.

4.2 Data Analysis

In order to answer the research questions, the collected Likert (ordinal) data was organized and analyzed to assess the extent and identify the most significant factors affecting rural electrification projects using relative importance index method. The identified factors were then ranked on the basis their relative importance indices. The relative importance index was calculated using excel spread sheet while the reliability of the data's collected, frequency distribution of respondents, Spearman rank correlation factor and T-test were computed by using SPSS-24 software.

4.2.1 Reliability Test

Since the data collected was based on Likert-scale; therefore to check reliability of the research Cronbach's Alpha method was used. The Cronbach alpha coefficient is used to measure the internal consistency. Prior to data analysis, the reliability of data was assessed using Cronbach's Coefficient Alpha. This was conducted for the entire factors to assess the reliability of the questionnaire. The Cronbach's alpha obtained for respondents' data is given in Table 9.

Table 9: Reliability Statistics of collected data

Cronbach's Alpha	No of Items
0.895	37

Its Cronbach's alpha was found to be 0.895 which showed high reliability of the data. The value must be in the range of 0.6 to 1.0 if the data has to be reliable. Hence the reliability test with of Cronbach's Alpha of 0.895 shows that the questionnaires are highly reliable and internally consistent.

4.2.2 Descriptive Statistics

This section presents the descriptive statistics of the questionnaires result. In this study SPSS-24 software is used for descriptive data analysis. The descriptive analysis used was frequency analysis to examine the percentage, mean, and standard deviation.

4.2.2.1 Questionnaire Response Rate

The study targeted a sample size of 101 respondents and accordingly a total of 101 questionnaires were distributed out of which 58 respondents were owners, 5 consultants and 38 contractors. On the other hand, out of 101 distributed questionnaire a total of 79 questionnaires were collected having been filled completely resulting a response rate of 78.22% as shown on table 10 below.

Table 10: Summary of the response rate of the study

Category	**Frequency**	**Percent**
Response/ fully filled	79	78.22
Not returned/ unfilled	22	21.78
Total	**101**	**100.00**

The researcher has given maximum effort and took longer time to collect the questionnaires in order to maximize the response rate. This response rate was good and adequate for analysis.

4.2.2.2 Respondents Characteristics

The first part of the questionnaire was designed for the purpose of obtaining information of the respondents' background which consists of organization type, position in the company, work experience and highest level of educational background.

4.2.2.2.1 Classification of Organization or Company

The questionnaires were distributed to the target groups who are the in the main participants in the electrification projects and these are owners, consultants and contractors. The response is shown on table 11.

Table 11: Respondents' representation of organization/ company

Organization/ company	Frequency	Percent
Owner	43	54.43
Consultant	4	5.06
Contractor	32	40.51
Total	**79**	**100**

Where out of 79 respondents who participated in this study, 43 (54.43%) were working in UEAP project office (owners), 4 (5.06%) from consultants while 32 (40.51%) from contractors.

4.2.2.2.2 Position in the Organization or Company

The questionnaires were distributed and responses were received from various professionals by virtue of their designation.

Table 12: Respondents' position in the organization/ company

Position	Frequency	Percent
Project manager	28	34.5
Engineer	32	40.5
Site coordinator	5	6.3
Site Supervisor	3	3.8
Planning and environmentalist	3	3.8
Accountant	5	6.3
Procurement officer	2	2.5
HR and logistic team	1	1.3
Others	0	0
Total	**79**	**100**

It was evident that the majority of the respondents were Engineers (40.50%) followed by Project Manager (34.50%). While the rest Site coordinator and Accountant both (6.30%), Site Supervisor, and Planning and environmentalist both (3.80%), Procurement officer (2.5%) and HR and logistic team (1.3%) as shown on table 12.

4.2.2.2.3 Work Experience in Projects

The information of the respondents' years of work experience in a project was also asked and summarized on table 13.

Table 13: Respondents' work experience in projects

Work experience	Frequency	Percent
Below 5 years	26	32.9
6 – 10 years	40	50.6
11 – 15 years	8	10.1
16 – 20 years	2	2.5
Over 20 years	3	3.8
Total	**79**	**100**

Accordingly, 40 (50.6%) indicated that they had been working between 6-10 years, followed 26 (32.9%) had been working below 5 years, 8 (10.1%) had been working between 11-15 years, 3 (3.8%) had been working over 20 years and 2 (2.5%) had been working between 16-20 years.

4.2.2.2.4 Educational Background

The study also sought to establish the respondents 'highest level of education and thus information relating to the level of education attained by the respondents was also analyzed.

Table 14: Respondents' highest level of education

Educational level	Frequency	Percent
Certificate	0	0
Diploma	8	10.1
Bachelor Degree	64	81
Master Degree	7	8
Others	0	0
Total	**79**	**100**

According to the findings as summarized on table 14 above, the vast majority of the respondents 64 (81.0%) had a bachelor degree, 8 (10.1%) had a diploma, while 7 (8.0%) of the respondents had a master degree but no respondent who had a certificate or other educational level. It is observed that about 90% of the respondents had obtained first degrees and above qualifications. This shows that the respondents are capable and reliable to explore the fundamental issues related to the study

4.2.2.3 Descriptive Statistics of Factors Affecting Success Electrification Projects

The respondents were asked to give their opinions on the listed factors affecting successful implementation of rural electrification projects. The responses were measured by a five point Likert scale. The collected data of the respondent were organized for further analysis with relative importance index method.

Table 15: Summary of descriptive statistics of collected data

No.	Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	SD
I	Project management related factors affecting successful implementation of projects							
1	Clearly defined and realistic goals/ objective	9 (11.4)	45 (57.0)	13 (16.5)	10 (12.7)	2 (2.5)	2.3797	0.93786
2	Effective communication among all project participants	2 (2.5)	17 (21.5)	22 (27.8)	35 (44.3)	3 (3.8)	3.2532	0.92637
3	Adequate project control and change management	0 (0)	12 (15.2)	21 (26.6)	41 (51.9)	5 (6.3)	3.4937	0.83010
4	Project performance monitoring and feedback	1 (1.3)	16 (20.3)	22 (27.8)	35 (44.3)	5 (6.3)	3.3418	0.91828
5	Detailed and up-to-date Project Planning	0 (0)	18 (22.8)	22 (27.8)	31 (39.2)	8 (10.1)	3.3671	0.94973
6	Adequate project feasibility studies	0 (0)	11 (13.9)	27 (34.2)	31 (39.2)	10 (12.7)	3.5063	0.88973
7	Realistic project cost and time estimates (scheduling)	0 (0)	12 (15.2)	23 (29.1)	38 (48.1)	6 (7.6)	3.4810	0.84521
8	Adequate use of project mgt tools and methodology	1 (1.3)	13 (16.5)	22 (27.8)	40 (50.6)	3 (3.8)	3.3924	0.85362
9	Effective quality assurance programme	3 (3.8)	25 (31.6)	28 (35.4)	19 (24.1)	4 (5.1)	2.9494	0.95942
10	Adequacy of designs and specifications	2 (2.5)	47 (59.5)	19 (24.1)	9 (11.4)	2 (2.5)	2.5190	0.82990
11	Decision making effectiveness	1 (1.3)	13 (16.5)	28 (35.4)	32 (40.5)	5 (6.3)	3.3418	0.87539
12	Troubleshooting / problem solving	1 (1.3)	8 (10.1)	27 (34.2)	35 (44.3)	8 (10.1)	3.5190	0.86024

No.	Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	SD
13	Risk identification and allocation	1 (1.3)	6 (7.6)	28 (35.4)	33 (41.8)	11 (13.9)	3.5949	0.8700
14	Involvement and commitment of stakeholders	4 (5.1)	21 (26.6)	37 (46.8)	16 (20.3)	1 (1.3)	2.8608	0.84329
II	Organization related factor							
1	Top management support and commitment to the project	3 (3.8)	21 (26.6)	30 (38.0)	21 (26.6)	4 (5.1)	3.0253	0.94699
2	Adequate project funding/ budget to completion	0 (0)	16 (20.3)	19 (24.1)	37 (46.8)	7 (8.9)	3.4430	0.90223
3	Appropriate organizational structure	3 (3.8)	27 (34.2)	26 (32.9)	18 (22.8)	5 (6.3)	2.9367	0.99153
4	Organizational culture	0 (0)	14 (17.7)	26 (32.9)	27 (34.2)	12 (15.2)	3.4810	0.97219
III	Procurement and contract related factors							
1	Effective procurement and tendering methods	1 (1.3)	35 (44.3)	28 (35.4)	12 (15.2)	3 (3.8)	2.7595	0.86551
2	Effective contract formulation and contract administration	1 (1.3)	28 (35.4)	24 (30.4)	20 (25.3)	6 (7.6)	3.0253	0.98677
3	Aligned supply chain of goods/materials and services	0 (0)	9 (11.4)	13 (16.5)	38 (48.1)	19 (24.1)	3.8481	0.92110
IV	Project manager and team related factors affecting successful implementation of projects							
1	Competence and experience of project manager	1 (1.3)	35 (44.3)	23 (29.1)	17 21.5)	3 (3.8)	2.8228	0.91651
2	Managerial and leadership skills of project manager	2 (2.5)	30 (38.0)	26 (32.9)	18 (22.8)	3 (3.8)	2.8734	0.92497
3	Project Manager's authority to take decisions	0 (0)	22 (27.8)	31 (39.2)	18 (22.8)	8 (10.1)	3.1519	0.94853
4	Experience and competence of design/ project team	0 (0)	35 (44.3)	28 (35.4)	15 (19.0)	1 (1.3)	2.7722	0.79983
5	Team spirit and commitment of design/ project team	4 (5.1)	24 (30.4)	34 (43.0)	16 (20.3)	1 (1.3)	2.8228	0.85873
V	Contractor/ supplier related factors							
1	Contractor's/ supplier's competence and commitment	2 (2.5)	25 (31.6)	33 (41.8)	19 (24.1)	0 (0)	2.8734	0.80650
2	Contractor experience	3 (3.8)	33 (41.8)	26 (32.9)	15 (19.0)	2 (2.5)	2.7468	0.89827
3	Effective site management, control and coordination	1 (1.3)	16 (20.3)	32 (40.5)	28 (35.4)	2 (2.5)	3.1772	0.82834

No.	Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	SD
4	Contractor's/ supplier's cash flow/ financial capabilities	1 (1.3)	16 (20.3)	35 (44.3)	21 (26.6)	6 (7.6)	3.1899	0.89265
VI	External and work environment factors							
1	Economic related factors (e.g. exchange rate, inflation, price escalation etc.).	2 (2.5)	13 (16.5)	18 (22.8)	41 (51.9)	5 (6.3)	3.4304	0.92934
2	Political related factors (e.g. political interference, political conflicts, vandalism etc.).	4 (5.1)	17 (21.5)	14 (17.7)	33 (41.8)	11 (13.9)	3.3797	1.12437
3	Socio-cultural related factors (e.g. customs, norms, values, languages, educational level, attitude towards social responsibility etc.).	5 (6.3)	19 (24.1)	20 (25.3)	29 (36.7)	6 (7.6)	3.1519	1.07523
4	Technical and technological related factors (e.g. method of construction etc.).	1 (1.3)	22 (27.8)	20 (25.3)	33 (41.8)	3 (3.8)	3.1899	0.93474
5	Physical environmental factors (e.g. harsh weather conditions etc.).	1 (1.3)	13 (16.5)	23 (29.1)	33 (41.8)	9 (11.4)	3.4557	0.94459
6	Site related factors (e.g. access road, ground condition, right off way, challenging terrains, other unforeseen conditions etc.).	1 (1.3)	7 (8.9)	12 (15.2)	44 (55.7)	15 (19.0)	3.8228	0.88809
7	X-Factors (e.g. fraudulent practices, corruption, favoritism, lack of ethics, etc.)	2 (2.5)	15 (19.0)	28 (35.4)	21 (26.6)	13 (16.5)	3.3544	1.05049

9(11.4) 9= frequency, 11.4= percent (%)

The descriptive statistics of the collected data were summarized in the frequency distribution with their respective percentages, means and standard deviations were presented on table 15.

4.2.3 Relative Importance Index and Ranking of Factors

In order to give an understanding to the extent to which each factor affecting rural electrification projects and determining the ranking of these factors, the Relative Importance Index (RII) was employed. The numerical scores from the questionnaire responses provided is an indication of the varying degree of influence that each factors affecting the projects. The relative importance index was computed for each factors as well as for each three groups of respondents i.e. owner, contractor and consultant separately. Based on the relative importance values, the factors were ranked and accordingly the ten most influential factors were identified as perceived by owner, contractors and consultants. Additionally, the overall ranking of factors of the aggregate result of the three group of respondents were calculated and which was taken for final conclusion.

4.2.3.1 Relative Importance Index of Project Management Related Factors

The respondents were asked to give their opinion on project management related factors affecting successful implementation of rural electrification projects. The project management related factors were subdivided into fourteen (14) factors. The collected questionnaire data were analyzed using relative importance index. Based on the results it was found that Risk identification and allocation was ranked first among project management related factors with a relative importance index of 0.7190. Troubleshooting/ problem solving was ranked second with RII of 0.7038, Adequate project feasibility studies was ranked third with RII value of 0.7013, project control and change management was ranked fourth with RII of 0.6987 while realistic project cost and schedule estimates was ranked fifth with RII value of 0.6962 and all rest have RII between 0.6785and 0.4759.

Table 16: Summary of RII of management related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	Project management related factors affecting successful implementation of projects									
1	Clearly defined and realistic goals/ objective	0.2861	14	0.0228	15	0.1671	15	0.4759	14	37
2	Effective communication	0.3620	11	0.0380	2	0.2506	11	0.6506	10	18
3	Adequate project control and change management	0.3848	4	0.0354	8	0.2785	4	0.6987	4	6
4	Project performance monitoring and feedback	0.3772	7	0.0380	2	0.2532	10	0.6684	8	16
5	Detailed and up-to-date Project Planning	0.3696	9	0.0354	8	0.2684	8	0.6734	7	14
6	Adequate project feasibility studies	0.3873	3	0.0405	1	0.2734	6	0.7013	3	5
7	Realistic project cost and time estimates (scheduling)	0.3797	6	0.0380	2	0.2785	4	0.6962	5	7
8	Adequate use of project mgt tools and methodology	0.3722	8	0.0354	8	0.2709	7	0.6785	6	12
9	Effective quality assurance programme	0.3468	12	0.0329	12	0.2101	13	0.5899	11	26
10	Adequacy of designs and specifications	0.2734	15	0.0253	14	0.2051	14	0.5038	13	36
11	Decision making effectiveness	0.3671	10	0.0354	8	0.2658	9	0.6684	8	16
12	Trouble shooting / problem solving	0.3823	5	0.0380	2	0.2835	3	0.7038	2	4
13	Risk identification and allocation	0.3924	1	0.0380	2	0.2886	2	0.7190	1	3
14	Involvement and commitment of stakeholders	0.3089	13	0.0304	13	0.2329	12	0.5722	12	30

The result of RII of project management related factors were tabulated on table 16.

4.2.3.2 Relative Importance Index of Organization Related Factors

The respondents were asked to give their opinions on organization related factors affecting successful implementation of rural electrification projects

Table 17: Summary of RII of organization related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	Organization related factors affecting successful implementation of projects									
1	Top management support and commitment to the project	0.3367	4	0.0278	3	0.2405	3	0.6051	3	24
2	Adequate project funding/ budget to completion	0.3772	2	0.0354	2	0.2759	1	0.6886	2	10
3	Appropriate organizational structure	0.3392	3	0.0278	3	0.2203	4	0.5873	4	27
4	Organizational culture	0.3797	1	0.0405	1	0.2734	2	0.6937	1	8

From the outcome of the study presented on table 17, majority of the respondents agreed that organizational culture is a major factor affecting rural electrification projects among organization related factors with a relative importance index value of 0.6937; followed by adequate project funding/ budget to completion is rated to be the second major factor with a relative importance index value of 0.6886 and top management support and commitment to the project is rated third with a a relative importance index value of 0.6051. The respondents further rated appropriate organizational structure forth with RII value of 0.5873.

4.2.3.3 Relative Importance Index of Procurement and Contract Related Factors

The respondents were asked to give their opinions on procurement and contract related factors affecting successful implementation of rural electrification projects

Table 18: Summary of RII of procurement and contract related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	Procurement and contract related factors affecting successful implementation of projects									
1	Effective procurement and tendering methods	0.2962	3	0.0278	2	0.2278	3	0.5519	3	34
2	Effective contract formulation and contract administration	0.3190	2	0.0253	3	0.2608	2	0.6051	2	24
3	Aligned supply chain of goods/ materials and services	0.4228	1	0.0380	1	0.3089	1	0.7696	1	1

Based on the outcome of the study on the aspect of procurement and contract presented on table 18, majority of the respondents agreed that aligned supply chain of goods/materials and services is a major factor affecting rural electrification projects among procurement and contract related factors with a relative importance index value of 0.7696; followed by effective contract formulation and contract administration is rated to be the second major factor with a relative importance index value of 0.6051 and effective procurement and tendering methods is rated third with a relative importance index value of 0.5519.

4.2.3.4 Relative Importance Index of Project Manager and Team Related Factors

The respondents were asked to give their opinions on project manager and team related factors affecting successful implementation of rural electrification projects. Accordingly,

majority of the respondents agreed that project manager's authority to take decisions is a major factor affecting rural electrification projects among project manager and team related factors with a relative importance index value of 0.6304; followed by managerial and leadership skills of project manager is rated to be the second major factor with a relative importance index value of 0.5747 and competence and experience of project manager as well as team spirit and commitment of design/ project team are rated third with a relative importance index value of 0.5646. The respondents further ranked experience and competency of design/ project team forth with relative importance index value of 0.5544.

Table 19: Summary of RII of project manager and team related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	Project manager and team related factors affecting successful implementation of projects									
1	Competence and experience of project manager	0.3215	3	0.0354	1	0.2076	5	0.5646	3	31
2	Managerial and leadership skills of project manager	0.3316	2	0.0329	2	0.2101	4	0.5747	2	28
3	Project Manager's authority to take decisions	0.3722	1	0.0329	2	0.2253	3	0.6304	1	22
4	Experience and competence of design/ project team	0.2937	5	0.0304	4	0.2304	1	0.5544	5	33
5	Team spirit and commitment of design/ project team	0.3038	4	0.0304	4	0.2304	1	0.5646	3	31

From the outcome of the study on the aspect of project manager and team related factors presented on table 19.

4.2.3.5 Relative Importance Index of Contractor/ Supplier Related Factors

The respondents were asked to give their opinions on contractor/ supplier related factors affecting successful implementation of rural electrification projects. From the outcome of the study on the aspect of contractor/ supplier presented on table 20, majority of the respondents agreed that contractor's/ supplier's cash flow/ financial capabilities is a major factor affecting rural electrification projects among contractor/ supplier related factors with a relative importance index value of 0.6380; followed by effective site management, control and coordination is rated to be the second major factor with a relative importance index value of 0.6354 and contractor's/ supplier's competence and commitment is rated third with a relative importance index value of 0.5747. The respondents further ranked contractor experience forth with relative importance index value of 0.5494.

Table 20: Summary of RII calculation of contractor/ supplier related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	Contractor/ supplier related factors affecting successful implementation of projects									
1	Contractor's/ supplier's competence and commitment	0.3342	3	0.0304	3	0.2101	3	0.5747	3	28
2	Contractor experience	0.3114	4	0.0304	3	0.2076	4	0.5494	4	35
3	Effective site management, control and coordination	0.3671	1	0.0329	2	0.2354	2	0.6354	2	21
4	Contractor's/ supplier's cash flow/ financial capabilities	0.3570	2	0.0354	1	0.2456	1	0.6380	1	19

4.2.3.6 Relative Importance Index of External and Work Environment Related Factors

The respondents were asked to give their opinions on external and work environment related factors affecting successful implementation of electrification projects.

Table 21: Summary of RII of external and work environment related factors

Item	Description	Owner		Consultant		Contractor		Overall		
		RII	Rank	RII	Rank	RII	Rank	RII	Group rank	Overall rank
	External and work environment factors affecting successful implementation of projects									
1	Economic related factors	0.3772	3	0.0354	2	0.2734	3	0.6861	3	11
2	Political related factors	0.3772	3	0.0329	5	0.2658	4	0.6759	4	13
3	Socio-cultural related factors	0.3519	7	0.0329	5	0.2456	7	0.6304	7	22
4	Technical and technological related factors	0.3570	6	0.0329	5	0.2481	6	0.6380	6	19
5	Physical environmental factors	0.3797	2	0.0354	2	0.2759	2	0.6911	2	9
6	Site related factors	0.4152	1	0.0405	1	0.3089	1	0.7646	1	2
7	X-Factors	0.3772	3	0.0354	2	0.2582	5	0.6709	5	15

The relative importance indices and ranks of the seven (7) factors that are classified under the ‘‘External and Work Environment Related Factors Category’’ are shown on Table 21. The respondents’ overall view ranked the site related factors as the most influential factor affecting rural electrification projects in this category, with a Relative Importance Index equals to 0.7646; followed by environmental factors are rated to be the second major factor with a relative importance index value of 0.6911 and economic related factors are rated third with a relative importance index value of 0.6861. The respondents further ranked political related factors forth, x-factors fifth with relative importance index value of 0.6759 and 0.6709 respectively.

4.2.4 Factor Analysis

In this study 37 factors were subjected to exploratory factor analysis, with principal component analysis and varimax rotation in order to identify strongly correlated factors and lump together to form principal components. The first step of the factor analysis was the assessment of the suitability of the data. There are two statistical measures generated by SPSS that help to assess the factorability of the data namely Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (Pallant, 2007).

Table 22: KMO and Bartlett's test of the data

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.653
Bartlett's Test of Sphericity	Approx. Chi-Square	1408.598
	df	666
	Sig.	0.000

Table 22 shows the result that the value of Bartlett's test of sphericity is 0.000 (sig.) and the Kaiser Meyer-Olkin (KMO) measure is 0.653 which is greater than 0.6. It is suggested that if the Bartlett's test of sphericity is significant, and if the Kaiser-Meyer-Olkin measure is greater than 0.6, therefore it is appropriate and accepted to proceed for the next step with exploratory factor analysis to extract factors that affecting successful implementation of rural electrification projects in Ethiopia.

Table 23: Rotated factor matrix of the data in exploratory factor analysis

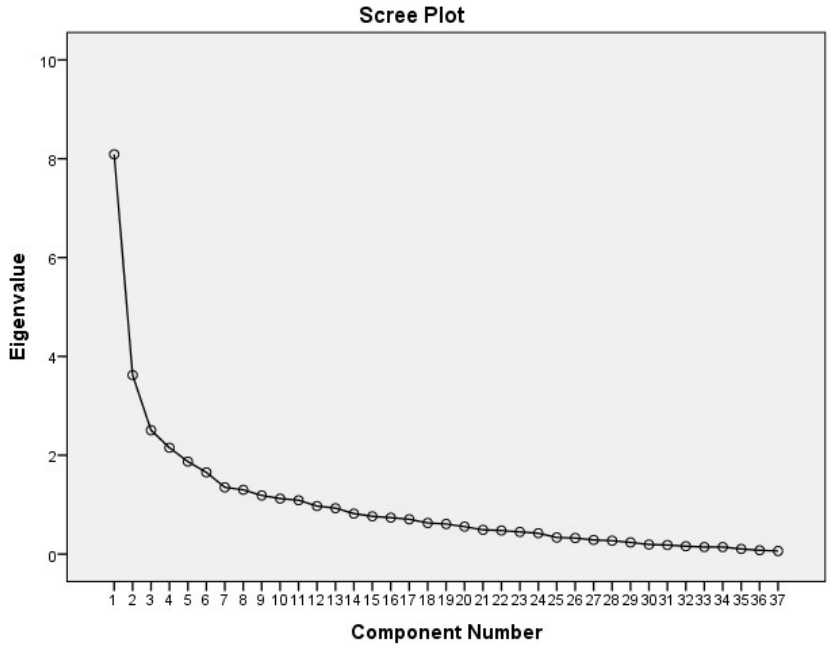
Rotated Component Matrix (Factor loading)											
	Components										
	1	2	3	4	5	6	7	8	9	10	11
Adequate project control and change management	0.678										
Realistic project cost and time estimates (scheduling)	0.647										
Adequate project feasibility study	0.605										
Project performance monitoring and feedback	0.572										
Detailed and up-to-date Project Plan	0.754										
Environmental factor		0.834									
Site related factor		0.742									
X-Factor (fraudulent practices, corruption, favoritism, lack of ethics,		0.726									
Aligned supply chain of goods/materials and services		0.547									
Political environment		0.507									
Managerial and leadership skills of project manager			0.850								
Competence and experience of project manager			0.849								
Project Manager's authority to take day-to-day decisions			0.715								
Effective site management				0.781							
Contractor's competence and commitment				0.636							
Contractor's cash flow/ financial capabilities				0.611							
Team spirit and commitment of design/ project team					0.702						
Effective quality assurance system					0.678						
Trouble shooting / problem solving					0.621						

Experience and competence of design/ project team					0.537						
Effective communication					0.528						
Socio-cultural environment						0.776					
Technical and technological environment						0.647					
Political environment						0.635					
Economic environment						0.550					
Appropriate organizational structure							0.724				
Organizational culture							0.665				
Effective contract formulation and contract administration							0.606				
Risk identification and allocation								0.677			
Top management support								0.636			
Adequate use of project management tools and methodology								0.566			
Adequate project funding/ budget to completion									0.864		
Involvement and commitment of stakeholders									0.557		
Clear requirements and specifications										0.680	
Contractor experience										0.626	
Clearly defined and realistic goals/ objective											0.831
Eigen values	8.090	3.621	2.506	2.151	1.871	1.653	1.350	1.300	1.187	1.122	1.090
% of variance	8.160	7.921	7.529	7.528	7.380	6.648	6.284	5.736	4.779	4.112	4.035
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.										
	a. Rotation converged in 21 iterations.										

The second and third steps of the analysis was to determine how many factors or components to extract and then factor rotation and interpretation. Based on the factor analysis of the questionnaire collected data, table 23 shows that the component matrix after

rotation with value of factor loadings more than 0.5. Whereby two factors with factor loadings less than 0.5 were eliminated. These are Effective procurement and tendering methods with factor loading value of 0.496 and Decision making effectiveness with factor loading value of 0.441. Additionally, table 23 presents the percentage of total variance and rotated Eigen values

Figure 2: Scree plot of the data



The number of components can be determined by scree plot graph as shown in Figure 2. Only components that have an Eigen values of 1 or more are considered. The graph shows a distinguish break up to the eleventh component number whereas after eleventh component the curve drop before a linear plateau follows. Thus, consideration can be take on the eleven (11) factors that should be analyzed and their Eigen values are 8.090, 3.621, 2.506, 2.151, 1.871, 1.653, 1.350, 1.300, 1.187, 1.122 and 1.090 for the first to eleventh components respectively. Based on the result of factor analysis done by SPSS, it was found that factor influence successful implementation of rural electrification projects in Ethiopia can be classified into eleven groups of factors.

Table 24: Classification of the rotated component of the data

No.	Component	Factors affecting successful implementation
1	Project planning, control and monitoring	Adequate project control and change management
		Realistic project cost and time estimates (scheduling)
		Adequate project feasibility study
		Project performance monitoring and feedback
		Detailed and up-to-date Project Plan
2	Physical, work environment and material supply	Environmental factor
		Site related factor
		X-Factor (fraudulent practices, corruption, favoritism, lack of ethics, etc.
		Aligned supply chain of goods/ materials and services
3	Project manager related	Managerial and leadership skills of project manager
		Competence and experience of project manager
		Project Manager's authority to take day-to-day decisions
4	Contractor capacity	Effective site management
		Contractor's competence and commitment
		Contractor's cash flow/ financial capabilities
5	Project team related	Team spirit and commitment of design/ project team
		Effective quality assurance system
		Troubleshooting / problem solving
		Experience and competence of design/ project team
		Effective communication
6	Macro environment (PEST analysis)	Socio-cultural environment
		Technical and technological environment
		Political environment
		Economic environment
7	Organization and contract related	Appropriate organizational structure
		Organizational culture
		Effective contract formulation and contract administration
8	Management related	Risk identification and allocation
		Top management support
		Adequate use of project management tools and methodology
9	Business environment	Adequate project funding/ budget to completion
		Involvement and commitment of stakeholders
10	Procurement and technical adequacy	Clear requirements and specifications
		Contractor experience
11	Project mission	Clearly defined and realistic goals/ objective

Based on the factor analysis done by SPSS and the result shown in table 24, it was found that eleven new components were successfully constructed using principal factor analysis and assigned as the factors affecting implementation of rural electrification projects.

The names of the classification new component groups in the order of their importance were (1) Project planning, control and monitoring, (2) Physical and work environment, (3) Project manager related, (4) Contractor capacity, (5) Project team related, (6) Macro environment /PEST analysis/. (7) Organization and contract related, (8) Management related, (9) Business environment, (10) Procurement and technical adequacy and (11) Project mission.

4.2.5 Spearman Rank Correlation Factor / Agreement Analysis/

The Spearman's rank correlation factor was used to show the degree of agreement between the rankings of different factors affecting successful implementation of rural electrification made by respondents from owner, consultant and contractor.

Table 25: Summary of Spearman correlation analysis

Spearman Rank Correlations

			Owner ranking	Consultant ranking	Contractor ranking
Spearman's rho	Owner ranking	Correlation coefficient	1.000	0.858**	0.883**
		Sig. (2-tailed)	.	0.000	0.000
		N	37	37	37
	Consultant ranking	Correlation coefficient	0.858**	1.000	0.760**
		Sig. (2-tailed)	0.000	.	0.000
		N	37	37	37
	Contractor ranking	Correlation coefficient	0.883**	0.760**	1.000
		Sig. (2-tailed)	0.000	0.000	.
		N	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

Accordingly the Spearman's rank correlation factor between the rankings of the three groups of respondents that is owner versus consultant, owner versus contractor and consultant versus contractor was analyzed using the Statistical Package for Social Science (SPSS-24) software and the result is presented on table 23 above.

The rank correlation coefficients for factors affecting rural electrification projects are 0.858 between owner and consultant, 0.883 between owner and contractor and 0.760 between consultant and contractor. This result shows that there is a positive and strong relationships between the rankings of the owner, consultants and contractor.

4.2.6 T-Test Analysis / Significance Test/

The t-test is used to determine whether there is a significant difference between the means of two independent (unrelated) groups. The test was used to compare the mean differences of owner with consultants, owner with contractors and consultants with contractors regarding the extent of each of the factors affecting the successful implementation of electrification projects in Ethiopia. The null hypothesis that "owners and contractors, owners and consultants, and contractors and consultants do not agree on ranking of influential factors affecting successful implementation of rural electrification projects" was tested using a t-test at a 95% confidence level. The significant level (alpha value) is set to be 0.05. The main value that is used to evaluate the groups is the significance value (*p*-value). If the value is greater than 0.05, the group variance can be treated as the same and no statistically significant difference exists. However, if the value is less than 0.05 then a significant difference exists between different group variances. The results of the T-test analyzed using the Statistical Package for Social Science (SPSS-24) on three groups

(owner vs consultant, owner vs. contractor, and consultant vs, contractor.) is shown on the table 24

Table 26: Summary of T-test analysis

Group Statistics

	N	Mean	Standard deviation
Owner	37	3.1756	0.32442
Consultant	37	3.3176	0.43561
Contractor	37	3.1725	0.40428

Independent Samples T-test

	t - value	p - value (two-tailed)	Result	Outcome
Owner vs. consultant	-1.590	0.116	$p > 0.05$	Accepted
Owner vs. contractor	0.036	0.971	$p > 0.05$	Accepted
Consultant vs. contractor	1.485	0.142	$p > 0.05$	Accepted

Pallant (2007) described interpretation of output from independent samples t-test as; if the value in the Sig. (two tailed columm) is equal or less than 0.05, there is a significant difference in the mean scores between the two groups but if the value is greater than 0.05, there is no significance difference between the two groups. Accordingly, all p-values (sig.) for each group are greater than 0.05, then there are no statistically significant differences between the organizations types (Owners, Contractors and Consultants). The null hypothesis was rejected in all three cases. The alternate hypothesis that all three parties generally agreed on the ranks was accepted. Again utilizing a t-test at a 95% confidence level of the same null hypothesis for the group influential factors resulted in the rejection of the null hypothesis in all three cases. Therefore, all the three parties generally agree on the ranking of the factors affecting successful implementation of electrification projects.

4.3 Research Findings

The perceptions of the respondents on factors affecting implementation of rural electrification projects were analyzed using the relative importance index method. This study also applies theory of constraints and stake holder theory as instruments in the project management to create an efficient and effective work flow in achieving a higher level of performance. It is clearly observed that all the top ten influential factors are due to various constraints and few stakeholder issues. Based on the overall rankings of all groups the top ten most significant factors affecting rural electrification projects in Ethiopia were discussed in detail below.

4.3.1 Aligned Supply Chain of Goods/Materials and Services

From survey of different respondents, and subsequent analysis of the data, it was found that aligned supply chain of goods/ materials and services is ranked the first most significant factor affecting project success of rural electrification implementation in Ethiopia. Aligned supply chain of goods/ materials and services is a timely availability of the required materials or services to the projects and has a nature of both material constraint and stakeholder contracting issues. This was mainly due to the fact that construction of electrical infrastructures for rural towns uses both local and imported materials as well as local services. The essential imported materials are conductors, insulators, transformers and different accessory fittings while local materials poles and concrete materials. The huge and continuing problem was the supply of concrete poles to cope up with the project demand. Of course some extent of impact also has been faced due to shortage of electrical materials such as insulators, conductors and transformers.

4.3.2 Site Related Factors

The respondent ranked site related factors as the second significantly influential factor affecting successful electrification project implementation. It is variable factors that related to the specific site and considered as technical constraints such as restricted access road, rocky ground, right off way problem, challenging terrains, unavailability of basic construction materials, and other unforeseen conditions.

4.3.3 Risk Identification and Allocation

From the result of data analysis, out of thirty seven (37) selected factors affecting electrification project, the factor "risk identification and allocation" was ranked third in significantly influencing electrification project implementation in Ethiopia. It includes both administrative constraints and technical constraints. The construction of electrical infrastructures, like any other construction projects, are risky due to the involvement of many contracting parties such as owners, consultants, contractors, sub-contractors, suppliers, etc. Electrical projects are perceived to have more inherent risks because of the long distance electric lines travels across different geographical topography, geological, weathers conditions, in addition to the economic, political, social and cultural conditions where the projects are undertaken.

4.3.4 Trouble Shooting/ Problem Solving

Troubleshooting/ problem solving is the fourth most important success factor as suggested by data from owner, contractors and consultants. From theoretical point of view, it can be considered as technical constraints and stakeholders issues. Problems exist in much higher extent in rural electrification projects the extent because the long distance electric line route crosses in different environment. Besides the technical problems, there are also

contractual problems they could be seen as conflicts which may lead to failure, if it is not well managed by the stakeholders.

4.3.5 Adequate Project Feasibility Studies

Adequate project feasibility studies, ranked the fifth most influential factor that affects successful implementation of rural electrification projects. The adequate feasibility study is considered as a technical constraints and it is a critical component of project preparation, and the basis of initial project decision. Therefore, feasibility study needs to be reliable, accurate and thorough. Since electric power lines travels a long distance the feasibility study should provide better technical solution to the needs, prior identification of risks as well as constraints, compensation programs and considering economic rationale for the project are vital for successful implementation.

4.3.6 Adequate Project Control and Change Management

Adequate project control and change management was ranked by the respondents as the sixth most influential factor that affects successful implementation of rural electrification projects. It is considered as technical and administrative constraints. Changes are considered to be any additions, deletions, or other revisions to the project scope that may result an increase or decrease in the project cost or schedule. In the case of rural electrification projects, changes happen many times in the form of a series of contract amendment. These changes occur primarily due to inadequate feasibility study, undetailed design, and poor or weak project control and contract administration.

4.3.7 Realistic Project Cost and Time Estimates (Scheduling)

Realistic project cost and time estimates (scheduling) was ranked by the respondents as the seventh most influential factor that affects successful implementation of rural electrification projects. It is characterized as a technical and administrative constraint. Project management success is measured based on the traditional measures of performance against schedule, cost and quality (Alvani et al, 2014). It follows that inaccurate estimate of schedule and cost will translate to poor schedule and budget performance and ultimately failure of project. It is witnessed that the rural electrification projects in Ethiopia were experienced a high cost and schedule estimation inaccuracies, which is obviously one of the causes of project poor performance in the country. Only a project that is well planned and scheduled can be well implemented.

4.3.8 Organizational / Corporate Culture

Organizational culture was ranked by the respondents as the eighth most significantly influential factor that affects successful implementation of rural electrification projects. Problems due to organizational culture are considered as social constraint. Organizational culture is a system consisting of shared attitudes, values and believes in performing the jobs in the projects implementation. The major variables under organizational culture affecting the performance of electrification projects are related to behavior of the management in general and employees in particular are issues such as lack of commitment, no clear task and authority relationships, turnover of employees, poor coordination and direction of activities, purpose and order and lack of innovative thinking for changes, failing to act proactively, fear to take responsibility and make decisions. Currently endeavor are under way to curb the problems of organizational culture through the implementation of balanced

score card (BSC) strategic management tool but still no tangible changes witnessed since the problems are deep rooted.

4.3.9 Physical Environmental Factors

From survey and analysis it was found that physical environmental factors ranked ninth most influential factor affecting successful implementation of electrification projects. Harsh weather condition particularly rainy seasons affects the progress and quality of the construction of electric infrastructure adversely. In most of cases the extreme conditions causes not only difficulty in considerable disruption of construction activities and mobilization resources to the site but it also causes complete closing of the site. In addition, extreme windy conditions in a certain part of the country causing damage of built electric power distribution lines.

4.3.10 Adequate Project Funding/ Budget to Completion

From survey of different contractor, consultants and clients, and subsequent analysis of the data obtained, it was found that continuous funding is the tenth most influential factor affecting implementation of electrification projects in Ethiopia. Inadequate funding is considered as administrative constraint. Adequate funding is important for the projects success because it effectively utilizes and makes the entire projects units active for completing on time. Ethiopia is a developing country; the root cause of inadequacy in continuous availability of funding is related to budgetary constraints. Main problems which occur due to inadequacy in funding are payment for wages, material supply etc.

4.3.11 Other Factors

From the study conducted, it was found that economic related factors (exchange rate, inflation, price escalation etc.), adequate use of project management tools and methodology, political related factors, detailed and up-to-date project planning, X-Factors (e.g. fraudulent practices, corruption, favoritism, lack of ethics, etc.) are the major influential factors ranked from eleventh to fifteenth respectively in affecting rural electrification projects in Ethiopia.

5. CONCLUSION AND RECOMMENDATIONS

The following research question was addressed: What are the most influential factors affecting successful implementation of rural electrification projects in Ethiopia? And what measures to be taken for improving the performance? On the basis of a comprehensive literature review thirty seven different potential factors were identified. A survey was then conducted in order to collect data about the occurrence and the extent of influence these factors exert in real life of the projects. Lastly relative importance index analysis of collected data was carried out and then ranking of factors were conducted. Based on the results, the conclusion and preferred recommendations of the study are as under.

5.1 Summary

This study's central question was answered by identifying study thirty seven (37) factors affecting successful implementation that were most often mentioned in theoretical studies. These factors and were analyzed and rated in order of their importance from the opinions of the respondents. Accordingly, the top ten (10) factors significantly affecting successful implementation which attention must be given are;

- Aligned supply chain of goods/ materials and services
- Site related factors
- Risk identification and allocation
- Troubleshooting/ problem solving
- Adequate project feasibility study
- Adequate project control and change management
- Realistic project cost and time estimates (scheduling)
- Organizational / corporate culture

- Physical environmental factors
- Adequate project funding/ budget to completion

Other factors include economic related factors, adequate use of project management tools and methodology, political related factors, detailed and up-to-date project planning, X-Factors (e.g. fraudulent practices, corruption, favoritism, lack of ethics, etc.) etc. but have relatively a moderate impact on rural electrification projects executed in Ethiopia.

The study also summarizes that group factors affecting project implementation of electrification projects were identified using the principal factor analysis. Accordingly, out of the eleven extracted components, the top five (5) most influential component factors were:

- Project planning, control and monitoring
- Physical, work environment and material supply
- Project manager related
- Contractor capacity
- Project team related

5.2 Conclusion

This study investigated and identified ten most influential factors that are important and will impact success of rural electrification projects positively if they are focused addressed by the stakeholders. In conclusion, it is understood that most of the important factors were related to project management, procurement and contract administration, external environment, and the organization itself. The project management related factors are risk identification and allocation, troubleshooting/ problem solving, adequate project feasibility study, adequate project control and change management, and realistic project cost and time

estimates (scheduling). The only powerful procurement and contract related factor is aligned supply chain of goods/ materials and services. The external environment is physical environmental factors. Under organization related factors there are adequate project funding/ budget to completion and organizational/ corporate culture. The nature of these factors are directly associated with various types of constraints namely material, technical, administrative and social problems. The other nature of these factors linked to communication and coordination between project stakeholders. The study concludes that the factors affecting successful implementation of rural electrification projects in Ethiopia are due to different constraints and stakeholders issue and therefore the performance of the projects can be improved through the implementation of theory of constraints and stakeholder theory. The application of theory of constraints can be achieved by identifying the system constraints and giving maximum effort to remove them.

5.3 Recommendation

In general the study recommends the application of the concepts of theory of constraints and stakeholder theory in the project management process as a tool for identifying and managing the constraints and stakeholders contractual issues that limits the projects from achieving higher performance with respect to its strategic goals.

Additionally the following particular recommendations were forwarded and the program office advised to give special attention to achieve greater performance and thereby gain effective implementation of rural electrification projects:

1. Properly plan both local and imported materials in alignment with the projects material requirement as well as proper utilization all the necessary available resources for the benefit of project success.
2. Identify potential risks and take steps to mitigate their exposure.
3. Prepare effective planning, scheduling and costing of the projects to match with the available resources so as to avoid intermittent delay of progress payment as a result of funding constraints.
4. Implement effective control and change management in contract management in order to avoid or minimize excessive changes in the scope of contract work and consequent increment of contract amount or extension of completion date.
5. Monitor and evaluate the project implementation at all stages from project feasibility studies to completion
6. Carry out thorough feasibility study of the projects both in technical and finical aspects.
7. Establish proper communication and coordination channels between UEAP and the various stakeholders to create alignment with the project objectives and avoid misunderstanding in the execution of the projects.

5.4 Suggestions for Further Studies

This study has faced some limitations as mentioned in section 1.7, which could be addressed in further studies. It is therefore recommended to conduct further studies on this issue covering the whole UEAP regional offices and participating all stakeholders.

REFERENCE

Osorio, P. C. F., Quelhas, O. L. G., Zotes, L. P., Shimoda E. and França, S. 2014. "Critical Success Factors in Project Management: An Exploratory Study of an Energy Company in Brazil." *Global Journal of Management and Business Research* 6.

n.d.

A O Akinsola, K F Potts, I Ndekugri and F C Harris. 1997. "Identification and evaluation of factors influencing variations on building projects." 2.

Babu, S. S. and Sudhakar. 2015. "Critical Success Factors Influencing Performance of Construction Projects." *International Journal of I nnovative Research in Science,* 4 (5): 3287, 3289-3290.

Bank, World. 2015a. *Implementation Completion and Result Report on the Second Electricity Access (Rural) Expansion Project.* Addis Ababa: World Bank.

Belassi, W., Tukel, O. I. 1996. "A new framework for determining." *International Journalof ProjectManagemen* 3-4,.

Bourne, L and Walker D.H.T. 2004. "Advancing Project Management in Learning Organizations." *The Learning Organization.*

Chan, A. P. C.; Scott, D.; and Chan, A. P. L. 2004. "Factors Affecting the Success of a Construction Project." *Journal Of Construction Engineering And Management.*

Chaurey A., Ranganathan M. and Mohanty P. . 2004. "'Electricity access for geographically disadvantaged rural communities: technology and policy insights'." *Energy policy* (32): 1693.

Chitkara, K. K. 1998. *Construction Project Management.* New Delhi: Tata McGraw-Hill Education.

Cochron, W.G. 1977. *Sampling Techniques.* N.Y: Wiley.

CPR. 2008. *EEPCO Newsletter*, March: 3.

Ejaz, N., Hussain, J., Shabbir, F., Shamim, M. A., Ali Naeem, U. A., Tahir, M. F. 2013. "Assessment of most critical success factors for mega construction projects in Pakistan." *Life Science Journal* 4.

Els, M., Van der Merwe, M.F. and Hauptfleisch, A.C. 2012. "Critical Success Criteria and Success Factors in Project Management: A quest to enhance generic professional Practice." *ICEC* 7-8.

Fortune, J. and White, D., 2006. 2006. "Framing of project critical success factors by a systems mode." *International Journal of Project* (24): 54.

Freeman, R.E. . 1984. *Strategic Management: A Stakeholder Approach.* Pitman Publishing Inc: Cambridge University Press.

Gunduz M., Yahaya, A. M. A. 2015. "Analysis of Project Success Factors." *Technological and Economic Development of Economy* 3-4.

Hendrickson, C. and Au,T. 2008. *Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects and Builders.* N.J: Prentice Hall.

Hwang, B. G., and E-Sin Janicia Lim, S. J. 2013. "Critical Success Factors for Key Project Players and." *Journal of Construction Eingeering and Management* 3-4.

HYVÄRI, IRJA. 2006. "Success of Projects in Different Organizational Conditions." *Project Management Institute* 6-7.

IEA. 2016. http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/.

Jiang J. J., Gray K., Joseph B. . 1996. "Ranking of System Implementation Success Factors." *Project Management Journal* 49-53.

Kanagawa M. and Nakata T. 2008. "'Assessment of access to electricity and the socio-economic impacts in rural areas of developing countries." *Energy policy* (36): 2016-2017.

Kefyalew, Mergiya. 2015. "Causes of Failure of Projects Under Universal Electricity AccessS Program of Ethiopian Electric Power: The Case of Projects Financed by Ethiopian Government." *MBA Thesis, Addis Ababa University, Department of Management*.

Kerzner, H. 2013. *Project Management: A Systems Approach to Planning, Scheduling, and Controlling.* N.Y: John Wiley & Sons.

Khandker, SR, Barnes, DF and Samad, HA. 2009. *Welfare impacts of rural electrification : a case study from Bangladesh.* Washington, D.C: The World Bank Development Research Group.

Kirsi, A. 2010. "Stakeholder Management in International Projects." *Aolto University, doctoral dissertation series* (13): 25.

Lim, C. S. and Mohamed M. Z. 1999. "Criteria of project success: an exploratory re-examination." *International Journal of Project Management* 1.

Milosevic, D. and Patanakul, P. 2005. "Standardized project management may increase development projects success." *International Journal of Project Management* (23): 183.

Mitchell, R.K., Agle, B.R. and Wood, D.J. 1997. "Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts." *International Journal of Project management* 22 (4): 855.

Muhammad Saqib, Rizwan U. Farooqui, Sarosh. H. Lodi. 2008. "Assessment of Critical Success Factors for Construction Projects in Pakistan." Karachi, Pakistan.

Müller, R. and Turner, R. 2007. "The influence of project managers on project success criteria and project success `by type of project." *European Management Journal* 25 (4): 299.

Newbold, Robert C. 1998. *Project Management in the Fast Lane: Applying the Theory of Constraints.* N.Y: CRC Press.

Orodho, J.,. 2003. *Essentials of educational and social science research methods.* Mazola Publishers.

P.O. Akanni, , A.E. Oke and O.A. Akpomiemie. 2014. "Impact of environmental factors on building." *Housing and Building National Research Center* 4.

Pallant, J. 2007. *SPSS Survival Manual: A Step-By Step Guide To Data Analysis Using SPSS for Windows.* N.Y: Open University Pess.

Pelegrini, L. and Tasciotti, L. 2012. "Rural Electrification Now and Then: Comparing Contemporary Challenges in Developing Countries to USA's Experience in Retrospect." *Forum for Development Studies,* (Erasmus University of Rotterdam, International Institute of Social Studies) 40 (1): 153.

Pinto, J. K., and Slevin, D. P. 1988. "Critical Success Factors Across the Project Life Cycle." *Project Management Journal* 174.

Pinto, J. K., Slevin D. P. 1987. "Critical Success Factors in Effective Project Implementation." 4-5.

PMI. 2013. *A Guide to the Project Management Body of Knowledge.* Fifth. Pennsylvania, USA: Project Management Institute.

Prabhakar, G. P. 2008. "What is Project Success." *International Journal of Business and Management.*

Research, BMG. 2014. *Factors in Project Success.* Birmingham, U.K: The Association for Project Management (APM).

Ritson, Neil. 2011. *Strategic Management.* bookboon.com.

Samset, K. 1998. "Project management in a high-uncertain situation,Ph.D. Dissertation." *Norwegian University of Technology* (Norwegian University of Science and Technology.) 23-24.

Sebastiano L. and Ragnhild K. 2014. "Constraint-shattering practices and creative action in organizations." *Organization Studies* (Sage) 35 (4): 596.

Silva Susit, G. A. K., Warnakulasuriya, B. N. F. and Arachige, B. j. H. 2015. *Critical Success factors for Construction Projects.* Colombo, Sir Lanka: Preceedings of 12th International Conference on Business Management, 11-12.

Stevenson, A. 2010. *Oxford Dictionary of English.* Oxford: Oxford University Press.

Timothy, C. U. 2011. *Stastics in Plain English.* N.Y: Taylor and Francis Group.

n.d. *Total Success Center.* Accessed 05 10, 2017. http://totalsuccesscenter.com/business-success/key-success-factors/.

Tsiga, Z., Emes, M. and Smith A. 2016. "Critical Success Factors for the Construction Industry." *PM World Journal.*

Turner, J. R., and Müller, R. 2003. "On the nature of the project as a temporary organization." *International Journal of Project Management* (21): 1.

Wit, Anton de. 1988. "Measurment of Project Success." *Butterworth & Co (Publishers) Ltd* 2.

Worldbank. 2015b. *http://www.worldbank.org/en/country/ethiopia/publication/ethiopia-great-run-growth-acceleration-how-to-pace-it.* November 23.

Wysocki, R. K. 2014. *Effective Project Management: Traditional, Agile, Extreme.* N.Y: John Wiley & Sons.

APPENDICES

APPENDIX 1: UEAP'S 2009 E.C Performance Report Summary

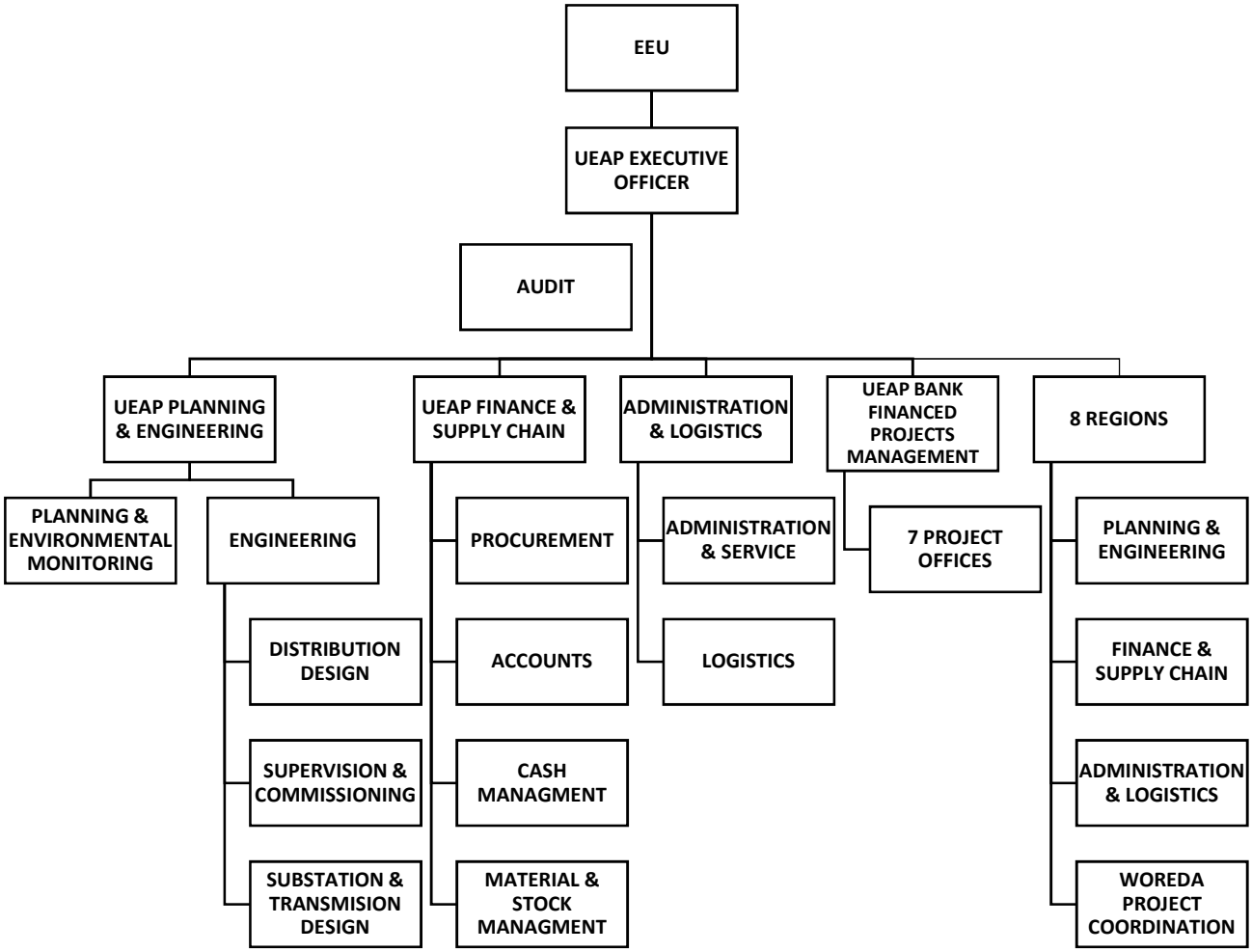
በ2009 በጀት አመት በሪጅኖች የተከናወኑ የኤሌክትሪክ ማዳረስ ተግባራት

- በአጠቃላይ በበጀት አመቱ በእቅድ ከተያዙ 1068 ከተሞች ውስጥ 595 አዲስ ቀበሌዎች እና መንደሮች የኤሌክትሪክ መስመር ግንባታ ተጠናቆ ርክክብ ተፈፅሟል፤እንዲሁም የ 69 ከተሞች ግንባታቸው ተጠናቀው የኤሌክትሪክ ሀይል ማገናኘት ብቻ ሲቀራቸው ሌሎች በተለያዩ የአፈጻጸም ደረጃ ላይ ይገኛሉ፡፡
- በተጨማሪም በመልሶ ግንባታ የሚሰሩ በእቅድ ከተያዙ 159 ከተሞች ውስጥ 114 ተጠቃሚ ሲሆኑ የ 7 ከተሞች ግንባታቸው ተጠናቀው የኤሌክትሪክ ኃይል ማገናኘት ብቻ ሲቀራቸው 11 ከተሞች በመንገድ ችግር ምክንያት ሥራቸውን ማከናወን ያልተቻለ ሲሆን ሌሎች በተለያዩ የአፈጻጸም ደረጃ ላይ ይገኛሉ፡፡
- በአጠቃላይ 709 ቀበሌዎችና መንደሮች በአመቱ የኤሌክትሪክ መስመር ግንባታ ተጠናቆ ርክክብ ተፈፅሟል፤
- የአገራዊ ኤሌክትሪክ ሽፋኑን 57.17 ማድረስ ተችሎዋል፡፡

APPENDIX 2: UEAP'S 2009 E.C Performance Summary Table

ተ.ቁ	ሪጅን	መለኪያ	የ2009 በጀት ዓመት እቅድና ክንውን				አጠቃላይ የ2009 እቅድና ክንውን ድምር		አፈጻጸም በመቶኛ
			የመልሶ ግንባታ		የአዲስ ከተሞች				
			እቅድ	ክንውን	እቅድ	ክንውን	እቅድ	ክንውን	
1	አፋር	በቁጥር	12	1	17	9	29	10	34.48
2	አማራ	በቁጥር	32	28	275	165	307	193	62.87
3	ቤንሻንጉል	በቁጥር	5	5	25	12	30	17	56.67
4	ድሬዳዋ	በቁጥር	0	0	3	2	3	2	66.67
5	ጋምቤላ	በቁጥር	3	2	13	5	16	7	43.75
6	ሐረሪ	በቁጥር	0	0	3	3	3	3	100.00
7	ኦሮሚያ	በቁጥር	77	64	394	212	471	276	58.60
8	ደቡብ	በቁጥር	6	5	226	146	232	151	65.09
9	ሶማሌ	በቁጥር	18	4	44	11	62	15	24.19
10	ትግራይ	በቁጥር	6	5	68	30	74	35	47.30
ድምር		**በቁጥር**	**159**	**114**	**1068**	**595**	**1227**	**709**	**57.78**

APPENDIX 3: Organizational Structure of UEAP



APPENDIX 4: Questionnaire Survey

Research Tile:

Factors Affecting the Successful Implementation of Rural Electrification Projects in Ethiopia: A Case of Universal Electric Access Program (UEAP)

Details of Researcher:

Name : *Behailu Ayele*

Mobile No. : *0911 895442* E-mail : *behayele02@gmail.com*

Advisor : *Kassahun Yimmer (PhD)*

General Information:

This questionnaire is designed to gather information on the research title "*Factors Affecting the Successful Implementation of Rural Electrification Projects in Ethiopia: a case of Universal Electric Access Program (UEAP)".* The study is being carried out for a research project in partial fulfillment of the requirements for the award of degree of Master of Business Administration in Construction Management of Addis Ababa Science and Technology University. I request you to take time and give your honest answers to the questions listed below. The information in the questionnaire will be treated with absolute confidentiality and at no instance will the name of the respondent or that of the organization he/she represents be mentioned in the research nor will the information provided be used for any purpose other than for this research.

Objectives of the Study:

5. To identify the significant factors that are affecting the successful implementation of rural electrification projects in Ethiopia.
6. To assess the extent to which the identified factors affect the successful implementation of rural electrification projects in Ethiopia.
7. To rank these factors according to the extent of their effects on successful implementation of rural electrification projects in Ethiopia.
8. To recommend possible solutions for achieving successful implementation of rural electrification projects in Ethiopia.

Scope of the Study:

The scope of the study covers only LV and MV distribution network construction projects under UEAP within the project life cycle from feasibility study to handover of completed works for both own force and contract projects. However transmission line and substation expansion projects undertaken under UEAP are not included in this study.

Instruction:

This questionnaire consists of three (3) sections:

Section A: General information of the respondent

Section B: Questions

Section C: Recommendation

Please take a look at the following questionnaire and consider UEAP's ongoing distribution line construction projects and give the most suitable answer to the questions appropriately in the provided space. Please also answer all the questions to enhance the objectivity of the research.

SECTION A: General Information of the Respondent

Please tick (√) the appropriate box to indicate your answer.

1. State the type of your organization or company.

   UEAP project office [ ] Contractor [ ] Supplier [ ]

   Consultant [ ] Others: …….

2. State your position in the organization or company.

   Engineer/ designer [ ] Project/ plant manager [ ] Supervisor [ ]

   Site coordinator [ ] Finance team [ ] Procurement team [ ]

   HR and logistic team [ ] Planning and environmentalist [ ]

   Others: …….

3. How many years of experience do you have in rural electrification project?

   Below 5 years [ ] 6 -10 [ ] 11-15 [ ]

   16 -20 [ ] Over 20 years [ ]

4. Kindly indicate your highest educational qualification.

   Certificate [ ] Diploma [ ]

   Bachelor Degree [ ] Master Degree [ ]

   Other (specify)…….

SECTION B: Questions

1. To what extent do the factors listed in the statements in the table below affect the successful implementation of rural electrification projects in Ethiopia?

No	Statement	*Please tick (√) the appropriate answers to indicate your reactions to the following statements*				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
i. Project management related factors						
1	UEAP projects have clearly defined and realistic goals/ objectives.					
2	There is effective communication among all project participants.					
3	There is adequate project control and change management.					
4	Project performance monitoring and feedback is carried out regularly and carefully.					
5	The projects have detailed and up to date project plan.					
6	Adequate project feasibility study was carried out.					
7	The projects have realistic project cost and time estimates (scheduling).					
8	Project management tools and methodology are adequately applied in the project management.					
9	Effective quality assurance system is in place to ensure quality standard					
10	There are sufficient/ well allocated resources throughout the project (e.g. vehicle, tools etc.).					
11	The designs and specifications are clear and adequate.					
12	Effective decision making is taking place					
13	There is effective trouble shooting / problem solving practices.					
14	Project risks are effectively addressed, assessed and managed.					
15	There is active involvement and commitment of project stakeholders.					

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
ii. Organization related factors						
16	There is top management support and commitment to the projects.					
17	The projects have secured adequate funding/ budget to completion.					
18	UEAP has appropriate organizational structure that facilitate project success					
19	There is a strong organizational/ corporate culture (shared attitudes, values and believes in performing the jobs) in the projects implementation (e.g. innovative thinking, acting proactively, no fear to take responsibilities etc.).					
iii. Procurement and contract related factors						
20	There is the use of effective procurement and tendering methods.					
21	There is an effective contract formulation and contract administration.					
22	There is a sufficient supply of goods/ materials and services aligned with the project needs, schedules, and quality standards (e.g. pole, conductor, insulator etc.).					
iv. Project manager and team related factors						
23	The project managers have the necessary technical competence and experience.					
24	The project managers have managerial and leadership skills.					
25	The project managers empowered with authority to take decisions.					
26	The design/ project team members are experienced and fully competent in their particular roles.					
27	The design/ project teams have a team spirit and commitment/ motivation to the project success.					

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
v. Contractor/ supplier related factors						
28	The contractors/suppliers have the necessary competence and commitment to the contract obligation.					
29	The contractors have adequate experience in these particular projects					
30	Effective site management, control and coordination are carried out by the contractors					
31	The contractors/ suppliers have cash flow/ financial capabilities to undertake the works effectively and consistently.					
vi. External and work environment factors						
32	The projects are not affected by economic related factors (e.g. exchange rate, inflation, price escalation etc.).					
33	The projects are not affected by political related factors (e.g. political interference, political conflicts, vandalism etc.).					
34	The projects are not affected by socio-cultural related factors (e.g. customs, norms, values, languages, educational level, attitude towards social responsibility etc. of the society within which the projects undertaken).					
35	The projects are not affected by technical and technological related factors (e.g. method of construction etc.).					
36	The projects are not affected by physical environmental factors (e.g. harsh weather conditions, etc.).					
37	The projects are not affected by site related factors (e.g. access roads, ground conditions, right off way, challenging terrains, other unforeseen conditions etc.).					
38	The projects are not affected by X-Factors (e.g. fraudulent practices, corruption, favoritism, lack of ethics, etc.).					

2. Please give your comment on the other influential factors that are not mentioned in the questions statements above.

   .....
   .....
   .....
   .....
   .....
   .....
   .....

3. In your view, how successful is the overall implementation of rural electrification projects in Ethiopia?

   Strongly successful [ ] Successful [ ] Neutral [ ]
   Unsuccessful [ ] Strongly unsuccessful [ ]

SECTION C: RECOMMENDATIONS

4. What possible solutions would you recommend to those challenges that you have recognized to ensure successful implementation of rural electrification projects in Ethiopia?

   .....
   .....
   .....
   .....
   .....
   .....
   .....
   .....
   .....
   .....

THANK YOU VERY MUCH FOR YOUR KIND COORPERATION